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TESTS OF HERBICIDES FOR THE CONTROL OF WEEDS IN LOWLAND RICE FIELDS [1]

CONSTANTINO F. LUCERO

WITH TWO TEXT FIGURES

Echinocloa crusgalli Beauv. was not killed by two applications of 0.08, 0.10, and 0.12 per cent 2,4-D Amine, 2,4-D Ester, or Fernoxone. Concentrations of 0.25, 0.50, and 1.0 per cent injured the weed slightly, but it recovered in about three weeks. Single applications of 0.08 and 0.10 per cent of the three herbicides gave 100 per cent kill of *Monochoria vaginalis* (L.) Presl. and *Eichhornia azurea* Kunth. *Lippia nodiflora* (L.) Rich. and *Ipomea reptans* (L.) Poir. were controlled by single applications of 0.08 and 0.10 per cent Amine, Ester, or Fernoxone. A second application of the same concentrations was needed to kill *Eclipta alba* (L.) Hassk. and *Sphenoclea zeylanica* Gaertn. On *Alternanthera ficoides* (L.) R. Br. and *Marsilea crenata* Presl., only one application of a 0.12 per cent concentration was necessary to effect 100 per cent kill. *Cyperus iria* L., *C. difformis* L., *C. pilosus* Vahl., *Scirpus erectus* Poir., *Bolbostylis barbata* Kunth., and *Fimbristylis miliacea* (L.) Vahl. were killed by 0.08 and 0.10 per cent solutions of the three herbicides with little or no injury to the rice plants. *Echinocloa colonum* (L.) Link. was resistant to 2,4-D treatment. Spraying 2,4-D on rice plants at the booting stage or 12 days after transplanting was detrimental.

The recent finding that 2,4-D (2,4-dichlorophenoxyacetic acid) will control certain weeds in rice fields without materially injuring rice plants has aroused considerable interest among workers.

Ryker and Brown (1947) of the Louisiana Agricultural Experiment Station reported that many broad-leaf weeds in lowland rice fields, such as indigo, curly indigo, and Mexican weed, could be controlled with 2,4-D.

Tullis [2] conducted experiments with 2,4-D in 1947 and reported good control of the principal weeds in rice fields in southeastern Texas.

Spraying 2,4-D by airplane to control weeds in rice fields is now a common practice in California, according to Davis.[3]

In Japan, Kasahara (1951) was able to kill most of the common weeds in paddy fields, except gramineous plants like *Echinocloa crusgalli* Beauv., with 2,4-D.

In the Philippines, however, very little work has been done to control weeds in lowland rice fields with herbicides. Ocfemia and

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[1] Central Experiment Station Contribution No. 1708. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Plant Pathology under the direction of Assistant Professor Faustino T. Orillo.

[2] Edgar C. Tullis, *A. and M. College of Texas Agric. Exper. Sta. Progress Report No. 1115* (1948). Mimeographed.

[3] Loren L. Davis, *Calif. Agric. Ext. Cir. 163* (1950).

[THE PHILIPPINE AGRICULTURIST, Vol. 37, Nos. 1 and 2, June, July, 1953, appeared in June, 1954.]
THE PHILIPPINE AGRICULTURIST, VOL. 37, NO. 3, AUGUST, 1953.

Javier (1950) did some work on the control of weeds in lowland rice fields, but their attention was focused mainly on water hyacinth (*Eichhornia azurea* Kunth.).

This study was conducted to find out the effects of herbicides on different species of weeds occurring in lowland rice fields and to determine the concentrations most effective against these weeds. The experiments were carried out in lowland rice fields in Bay and Calamba, Laguna, from December, 1951, to March, 1953.

MATERIALS AND PROCEDURE

The herbicides [4] used in this study are briefly described below:

1. Du Pont 2,4-D Amine Weed Killer—Selective; liquid; contains 49.6 per cent Dimethylamine 2,4-Dichlorophenoxyacetic acid as active ingredient.

2. Hi-Ester 2,4-D Weed Killer—Selective; liquid; contains 2,4-Dichlorophenoxyacetic acid, isopropyl ester 50.2 per cent and 2,4-Dichlorophenoxyacetic acid, propylene glycol (C_3H_6O to $C_9H_{13}O_3$) Butyl ether esters 32.6 per cent as active ingredients; total active ingredients, 82.8 per cent.

3. Fernoxone—Selective; powder; contains 80.0 per cent sodium salt of 2,4-Dichlorophenoxyacetic acid as active ingredient.

Five-square-meter lots or strips were staked off in lowland rice fields abounding in different species of graminaceous and nongraminaceous weeds. Lots with young weeds were preferred to those with old ones since previous investigations have shown that mature plants are usually more difficult to kill than young tender ones.[5] The stage of growth, condition of flowering, and approximate age of each species of weed [6] present in the plots at the time of treatment were recorded. Plant counts were made when necessary. The weather data [7] one day before, during, and one week after the application of herbicides were gathered (table 1).

The herbicides were prepared as aqueous solutions. The concentrations were based on the percentage of active ingredients of the materials. At the start three concentrations were used: the recommended concentration or one used by previous workers, a higher one, and an intermediate between the two. A much higher concentration was used when all tried concentrations failed to obtain 100 per cent kill. On the other hand, a lower one was used when all concentrations gave 100 per cent kill in order to determine the minimum concentration that would effect complete kill.

The herbicides were sprayed with a Hudson Clipper No. 139 and a Shelltox Continuous Sprayer. One concentration of the chem-

[4] Obtained from the Shell Company of P. I., Ltd., and from Macondray and Co., Inc., Manila.

[5] Oliver C. Lee, *Purdue Univ. Agric. Ext. Serv. Leaflet 297* (n.d.).

[6] Identified by Mr. Juan V. Pancho of the Department of Agricultural Botany.

[7] Compiled by the Department of Agricultural Engineering.

ical was applied to each experimental plot at the rate of one liter to every five square meters. Each lot was labeled with the concentration of the herbicide applied and the date of treatment. Control plots were left unsprayed for comparison.

The herbicides were sprayed during hot days and when the sky was clear. In spraying it is important that weather conditions be taken into consideration because, as Kephart and Evans [8] stated, the effevtiveness of 2,4-D is reduced if rain falls within an hour or so after treatment. Apparently the chemical is washed off the sprayed plants before maximum absorption takes place. The spray was so applied that all the weeds received at least a little of it. Buchholtz and Briggs [9] observed that weeds need not be wet completely for a good kill. Evans, Mitchell, and Heinen [10] said that "most plants absorb 2,4-D rapidly. It will penetrate any part of a succulent plant—roots, stem, leaves, flowers, or bud. Once inside, the chemical moves rapidly." According to Mitchell (1947), 2,4-D travels through the plants both upward and downward from the place where it is applied. The plants in the different lots were examined before and after herbicide treatment and when they appeared dead.

EXPERIMENTS AND RESULTS

On baya-kibok (Echinocloa crusgalli Beauv.)

Kasahara (1951) reported that when 60 to 120 g. (0.05-10%) of 2,4-D was sprayed on a drained field, all of the weeds, except the gramineous plants such as *Echinocloa crusgalli* Beauv., were killed. According to Ryker (1948), the control of barnyard grass (*Echinocloa* sp.) is one of the three problems in the control of weeds in rice fields.

Experiment 1. This experiment was conducted on July 13, 1952, to find out whether chemical control of *baya-kibok* could be done locally. The weed in its preflowering stage was sprayed with 0.08, 0.10, and 0.12 per cent Amine, Ester, and Fernoxone. The next day after treatment no visible effect of the chemicals was observed. One week later, the plants treated with the 0.10 and 0.12 per cent concentrations wilted slightly. After two weeks, however, they recovered and showed apparently normal growth. Very slight wilting of the plants in the 0.08 per cent treatment was noted on the ninth day after spraying, but five days later the plants recovered. New growths appeared and plant counts were made four weeks after treatment (table 2). A second application produced the same results.

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[8] L. W. Kephart and L. S. Evans, *USDA Res. Administration Unnumbered Cir.* (1948).

[9] K. P. Buchholtz and G. M. Briggs, *Univ. of Wis. Ext. Serv. Stencil Cir. 271* (1948).

[10] L. S. Evans, J. W. Mitchell, and R. W. Heinen, *USDA Farmers' Bull. 2005* (1948).

Experiment 2. Since all the weeds survived the first experiment, a second one was done on August 9, 1952, using higher concentrations of 0.25, 0.50, and 1.0 per cent of the three 2,4-D herbicides. Five days after treatment, slight wilting of the tips of the longest leaves was observed. The rice plants in the sprayed lots, especially those in the 1.0 per cent treatment, became yellowish. The effect of the chemical on the weeds was only temporary, for they recovered in about three weeks. As in experiment 1, new growths also appeared (table 3). The applications were not repeated because of the danger of further damaging the rice plants.

The results of the two experiments indicate that *E. crusgalli* Beauv. will not be easy to control with 2,4-D herbicides.

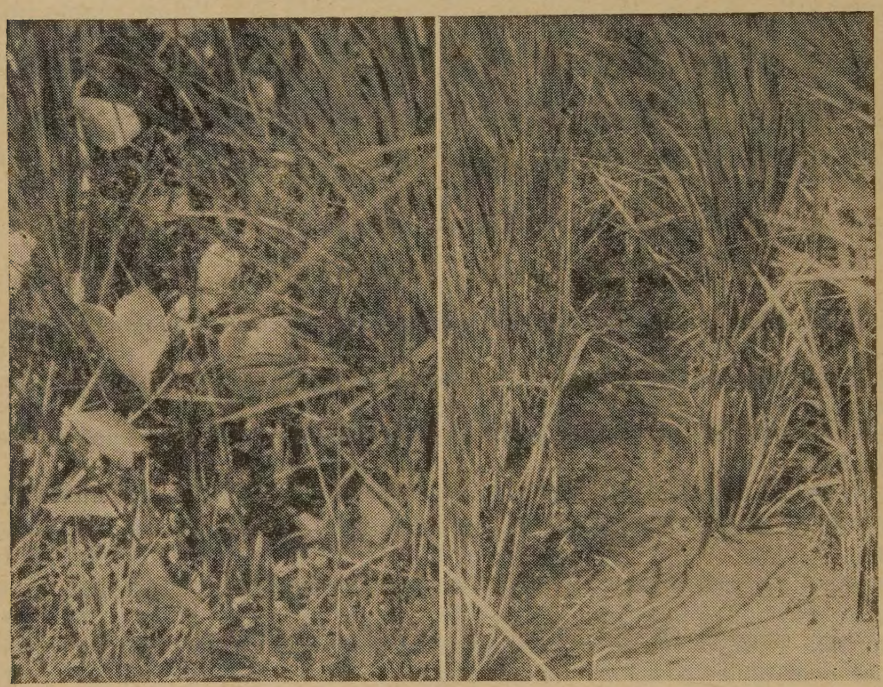

Fig. 1.—The effect of 2,4-D Amine on *Monochoria vaginalis* Presl. Left, *gabing-uak* and rice plants growing in control lot. Right, *gabing-uak* two weeks after treatment with 0.1 per cent Amine. Note that *gabing-uak* appears like compost, but rice plants have recovered and are growing vigorously. (*Photographed by John M. Taylor.*)

On gabing-uak (*Monochoria vaginalis Presl.*)

Experiment 1. On July 12, 1952, *gabing-uak* was sprayed with 0.08, 0.10, and 0.12 per cent of the three 2,4-D herbicides. The plants were about a foot tall and were in the preflowering stage. Within five hours after treatment the plants wilted slightly, especially those sprayed with the higher concentrations. The next day

the plants drooped and the petioles became twisted. On July 14, the stems bent (fig. 2) and most of the plants treated with the higher concentrations dropped to the ground. Evans, Mitchell, and Heinen [11] stated that 2,4-D may cause stems of succulent plants to grow more rapidly on one side than on the other, giving the plants a bent or wilted appearance. The leaves gradually lost their green color. A week later, they started to yellow and to dry up, and the plants dropped to the ground. Yellowing and drying of the leaves progressed until they fell off. In two weeks decay of the weeds was complete, resulting in a compost-like material (fig. 1, right).

Fig. 2.—The effect of 2,4-D Ester on *Monochoria vaginalis* Presl. Left, *gabing-uak* two days after treatment with 0.08 per cent 2,4-D Ester. Note the bending and twisting of the plants. Right, one week after treatment. Most of the weeds have dropped to the ground. (*Photographed by John M. Taylor.*)

Experiment 2. Since all concentrations in experiment 1 killed the weeds completely (table 4), another experiment using lower concentrations of 0.06, 0.08, and 0.10 per cent of the three 2,4-D herbicides was conducted on August 2, 1952. The day after treatment, effects similar to those observed in experiment 1 were noted among the plants sprayed with the higher concentrations. The flowers of the treated plants wilted. Bending, twisting, and subsequent dropping of the plants to the ground followed. Complete decomposition was obtained after two weeks. Plants treated with the 0.06 per cent concentration reacted slowly. Curling of the tips of the leaves was noted the day after treatment. In two weeks, some of the plants were able to recover, but they were stunted in growth (table 5).

[11] *Ibid.*

Experiment 3. On January 5, 1953, the three herbicides were sprayed on selected lots where *gabing-wak* was the principal weed. The concentrations used were the same as those used in experiment 2. One hundred per cent kill was obtained with the 0.08 and 0.10 per cent concentrations, showing that this weed can be readily controlled with 2,4-D at these concentrations. The lower one should be used with the ester form and the higher one with the amine and sodium salts. According to Kephart and Evans [12] the ester form of 2,4-D should be applied at a lower rate, for it is more active than the other forms. Leasure (1950) noted that although the ester form is the most effective, it is the most expensive form and requires more care in using.

On water hyacinth (Eichhornia azurea Kunth.)

Experiment 1. On January 19, 1952, water hyacinths along the dikes were sprayed with 0.08, 0.10, and 0.12 per cent Amine. Only one chemical was used because there were not enough hyacinths. No growths could be found in the paddies. The effect of the chemical one day after treatment was a slight wilting of the leaves. On January 21, most of the water hyacinths manifested bending of the stems and drooping of the leaves. Withering and drying of the leaves followed until the plants died in about two to three weeks.

Experiment 2. Growths of water hyacinths in the preflowering stage among the rice plants in the paddies were sprayed on February 9, 1952, with 0.06, 0.08, and 0.10 per cent 2,4-D Amine, 2,4-D Ester, and Fernoxone. Three days after spraying, the effect of the chemicals was discernible in all the lots. Wilting, drooping, and drying of the leaves followed. On the 18th day after treatment, all the plants that were sprayed with the two higher concentrations were dead. Rice plants in these lots became dark green after this period; however, they continued to grow as normally as those in the control lots. A few water hyacinths were able to survive the 0.06 per cent treatments, but a second application killed them completely after two weeks.

The results of these experiments closely agree with those of Ocfemia and Javier (1950) who were able to kill young water hyacinths with 1000 ppm. (0.1%) 2,4-D. Derico (1951) killed water hyacinths growing on the shore of Laguna de Bay with a very much higher concentration of 1.0 per cent.

On other "broad-leaf" plants

Lippia nodiflora (L.) Rich. In the experiments on *baya-kibok*, the effect of the chemical on *Lippia nodiflora* was also observed. Good control was obtained at all concentrations. The first reaction of the weeds was noticed the day after treatment. It consisted of bending of the stems and curling of the leaves. After three days

[12] Kephart and Evans, *op. cit.*

the leaves changed from green to yellowish. After one week the leaves finally turned brownish, and eventually the above-ground portions of the plants died. The weeds were completely decomposed in about two weeks.

Alternanthera ficoides (*Linn.*) *R. Br.* This weed was present in the experimental lots of *gabing-uak* treated with 0.08, 0.10, and 0.12 per cent of the three 2,4-D herbicides. The first reaction of this plant to the herbicides, consisting of curling and twisting and, later, yellowing of the leaves, was not noticed until after two days. After 10 days the plants in all treatments of the 2,4-D Ester were totally decayed. A few plants were able to survive the 0.08 per cent treatment of Amine and Fernoxone. However, 100 per cent kill was obtained with the higher concentrations after two weeks.

Minor "broad-leaf" plants. The minor "broad-leaf" weeds found in the experimental lots were *Ipomoea reptans* (L.) Poir., *Eclipta alba* (L.) Hassk., *Sphenoclea zeylanica* Gaertn., and *Marsilea crenata* Presl. *Ipomoea reptans* was readily killed by the 0.08, 0.10, and 0.12 per cent concentrations of the three 2,4-D herbicides. *Eclipta alba* and *Sphenoclea zeylanica* required a second treatment before complete kill was obtained. *Marsilea crenata* was rather tolerant to 2,4-D, but the highest concentration (0.12%) of Ester gave 100 per cent kill.

The weather did not visibly affect the results of the treatments.

On "narrow-leaf" plants

Aside from *Echinocloa crusgalli* Beauv., a number of other weeds were present in some of the treated lots. Their reactions to 2,4-D were not seen until after several days. On *Cyperus iria* L., *C. difformis* L., *C. pilosus* Vahl., and *Scirpus erectus* Poir. of the family Cyperaceae, the effects of the herbicides became apparent six to seven days after treatment. The part of the stalks near the ground became shrunken and markedly discolored. When the weeds were pulled, the upper portions of the plants were removed, but the roots remained in the ground. Two weeks after treatment, most of the weeds lodged to the ground. They were partly or totally submerged in the paddies. Further examinations revealed that nearly all of the above-ground parts of the severely affected plants were totally separated from their rootstocks. The plants were completely rotten and looked like compost three weeks after treatment. Generally, the 0.12 per cent concentration of the three 2,4-D herbicides killed the weeds in a short time. However, the rice plants which were slightly injured by this concentration took a longer period to recover. The 0.08 per cent Ester and the 0.10 per cent Amine and Fernoxone appeared to be the best concentrations against these cyperaceous weeds, for they effected complete kill and the rice plants which were slightly injured assumed normal growth four weeks after treatment.

Fimbristylis miliacea (L.) Vahl. and *Bolbostylis barbata* Kunth. showed similar characteristic reactions to 2,4-D as the previously

mentioned species. They were killed by 0.08 and 0.10 per cent of the three 2,4-D herbicides in about two to three weeks after treatment.

Echinocloa colonum (L.) Link. was resistant to 2,4-D. The 0.08, 0.10, and 0.12 per cent concentrations of the 2,4-D herbicides did not affect this weed at all. The higher concentrations of 0.25 and 0.50 per cent caused wilting of the weed after one week, but at the same time rice plants turned darker green and became stunted in growth. The weeds fully recovered after four weeks. The rice plants assumed normal growth in about five weeks after treatment, but their dark-green color persisted throughout the growing season.

Two other grasses that were not affected by the chemicals were *Saccharum spontaneum* L. and *Panicum stagninum* Retz. Since these grasses were growing mostly on the dikes and caught the sprays only in the form of drifts, it could not be ascertained whether they were really resistant to 2,4-D treatment.

On rice plants

Rice plants (Guinangang variety) in the experimental lots (*vide* experiment 2 on *baya-kibok*) treated with the higher concentrations of 0.25, 0.50, and 1.0 per cent of the three 2,4-D herbicides began to show reaction to the chemicals five days after treatment. The first effect was the marked yellowing of the leaves. Subsequent curling of the tips of the leaves and slight drooping of the stems were observed. The yellowing of the rice plants, however, was just temporary. Eight days after the treatment, the plants turned dark green, and they retained this color for the rest of the growing period. Rice plants in the 0.08, 0.10, and 0.12 per cent treatments (*vide* experiment 1 on *baya-kibok*) showed characteristic yellowing of the leaves one week after spraying. Some of the plants that received the lowest concentration (0.08%) did not show any sign of injury.

In one lot treated with 1.0 per cent Ester and where the water in the paddies was very low or almost absent, the effect on the rice plants was severe. The plants, besides changing in color, were stunted. Crafts and Harvey [13] cautioned against the spraying of rice when the water is low or off. They recommended that the water level be kept up until after treatment.

In an experiment on December 17, 1952, young rice plants (12 days after transplanting) of the Malagkit Sungsong variety were sprayed with 200 cc. of 0.80, 0.10, and 0.12 per cent of the three herbicides in one-square-meter lots. The seedlings were observed to be very sensitive to the chemicals. The day after treatment, the effect was so severe that the plants appeared to have been burned. After a week, all the seedlings in the lots treated with the chemicals died.

[13] Alden S. Crafts and W. A. Harvey, *Calif. Agric. Ext. Serv. Cir. 157* (1949).

In another experiment on February 16, 1953, rice plants of the Guinangang variety at the booting stage were sprayed with the three herbicides at the same concentrations mentioned above. Five days after treatment most of the flowers were found to be blasted.

Since susceptibility of rice to 2,4-D was tested at only two stages in its development, it would be unwise to make a definite deduction from the results of the tests. The possibility remains, however, that spraying at any time between these two stages may prove less harmful to the rice plants. According to Ryker (1948), when the rice seedlings are already three to four weeks old, it is relatively safe to use 2,4-D.

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TABLE 1

Weather data during the experiments

EXPERIMENT ON	DATE OF TREATMENT	WEATHER DATA			REMARKS
		Temp.[b]	Relative humidity [b]	Total precipitation [c]	
		°C.	*per cent*	*mm.*	
Echinocloa crusgalli (1)[a] ..	7/13/52	no data	no data	no data [d]	Plants in the flowering stage. Slight drizzle at about 4:00 p.m. on July 14.
Echinocloa crusgalli (2) ...	8/ 9/52	26.1	89.3	98.7 [d]	Plants beginning to bloom. Rainy days—Aug. 10, 14, 15, 16.
Monochoria vaginalis (1) ..	7/12/52	no data	no data	no data	Plants in the preflowering stage. No rainfall on July 13.
Monochoria vaginalis (2) ..	8/ 2/52	24.9	92.9	196.2	Some plants were beginning to flower. Rainy days—Aug. 4, 5, 6, 7, 8.
Monochoria vaginalis (3) ..	1/5 /53	24.3	82.1	4.3	Plants in the preflowering stage. Rainy days—Jan. 10, 11.
Eichhornia azurea (1)	1/19/52	25.0	81.1	10.0 [d]	Plants in the flowering stage. Rainy days—Jan. 20, 22, 23.
Eichhornia azurea (2)	2/ 9/52	26.3	77.8	13.1	Plants in the preflowering stage. Rainy days—Feb. 11, 14.
Lippia nodiflora	7/13/52	no data	no data	no data [d]	Plants just past the seedling stage. Slight drizzle at about 4:00 p.m. on July 14.
Alternanthera ficoides	7/12/52	"	"	"	Plants in the flowering stage. No rainfall on July 13.

[a] Figure represents the experiment number.
[b] Mean for nine days, one day before, during, and seven days after treatment.
[c] Total for nine days; one day before, during, and seven days after treatment.
[d] Rained 24 hours after application of herbicides.

TABLE 2

Stand of Echinocloa crusgalli after spraying with different concentrations of Amine, Ester, and Fernoxone

(*Experiment 1*)

HERBICIDE	CONCENTRATION	MEAN HEIGHT [a]	ORIGINAL COUNT	FINAL COUNT [b]	PERCENTAGE KILLED
	per cent	*cm.*			
Amine	0.08	41	2	6	0
	0.10	46	3	7	0
	0.12	42	2	5	0
Ester	0.08	45	3	8	0
	0.10	41	2	4	0
	0.12	48	2	6	0
Fernoxone	0.08	42	4	6	0
	0.10	43	2	6	0
	0.12	48	2	5	0

[a] Measured from the base to the tip of the longest leaf.
[b] Four weeks after treatment; includes new growths from parent plant and those that sprang up separately within the treated lot.

TABLE 3

Stand of Echinocloa crusgalli after spraying with different concentrations of Amine, Ester, and Fernoxone

(*Experiment 2*)

HERBICIDE	CONCENTRATION	MEAN HEIGHT [a]	ORIGINAL COUNT	FINAL COUNT [b]	PERCENTAGE KILLED
	per cent	*cm.*			
Amine	0.25	73	7	12	0
	0.50	65	6	13	0
	1.00	61	9	16	0
Ester	0.25	60	8	14	0
	0.50	71	5	11	0
	1.00	67	6	13	0
Fernoxone	0.25	63	4	11	0
	0.50	64	9	17	0
	1.00	71	7	15	0

[a] Measured from the base to the tip of the longest leaf.
[b] Four weeks after treatment; includes new growths from parent plant and those that sprang up separately within the treated lot.

TABLE 4

Stand of Monochoria vaginalis after spraying with different concentrations of Amine, Ester, and Fernoxone

(Experiment 1)

HERBICIDE	CONCENTRATION	MEAN HEIGHT [a]	MEAN DIAMETER [b]	ORIGINAL COUNT	FINAL COUNT [c]	PERCENTAGE KILLED
	per cent	*cm.*	*cm.*			
Amine	0.08	21	1.3	37	0	100.00
	0.10	19	1.2	32	0	100.00
	0.12	23	1.4	36	0	100.00
Ester	0.08	25	1.5	33	0	100.00
	0.10	22	1.4	35	0	100.00
	0.12	24	1.4	38	0	100.00
Fernoxone	0.08	19	1.2	32	0	100.00
	0.10	22	1.3	28	0	100.00
	0.12	24	1.3	29	0	100.00

[a] Measured from the base to the tip of the longest leaf.
[b] Measured at water level.
[c] Four weeks after treatment.

TABLE 5

Stand of Monochoria vaginalis after spraying with different concentrations of Amine, Ester, and Fernoxone

(Experiment 2)

HERBICIDE	CONCENTRATION	MEAN HEIGHT [a]	MEAN DIAMETER [b]	ORIGINAL COUNT	FINAL COUNT [c]	PERCENTAGE KILLED
	per cent	*cm.*	*cm.*			
Amine	0.06	37	1.6	59	16	72.9
	0.08	45	2.0	71	0	100.00
	0.10	40	1.8	64	0	100.00
Ester	0.06	42	2.0	69	11	84.1
	0.08	43	1.9	77	0	100.00
	0.10	39	1.8	74	0	100.00
Fernoxone	0.06	41	1.7	68	17	75.0
	0.08	42	1.6	72	0	100.00
	0.10	39	1.8	64	0	100.00

[a] Measured from the base to the tip of the longest leaf.
[b] Measured at water level.
[c] Four weeks after treatment.

THE RELATION OF LENGTH OF INCUBATION PERIOD TO GROWTH, MORTALITY, AND SEX RATIO IN SINGLE COMB WHITE LEGHORN CHICKS [1]

ELPIDIO C. COLIGADO

At 12 weeks of age, lot I (early emerging) birds weighed an average of 817.3 ± 8.7 grams; lot II (middle emerging), 760.0 ± 14.6 grams; and lot III (late emerging), 757.4 ± 21.1 grams. The percentage of mortality was lowest in lot I and highest in lot II. Female chicks predominated during the first eight hours of hatch; equal numbers of males and females were observed in the next eight hours, except in trial 1; and slightly more males than females during the last eight hours of hatching. The amounts of feed consumed by the birds in the different lots did not differ markedly.

Poultry breeders and hatchery men generally believe that chicks which hatch after a short incubation period grow faster and have a lower mortality rate than those which hatch after a long period of incubation.

Henderson and Champion (1948) found that New Hampshire chicks which emerged from their shells early tended to be heavier at eight weeks of age than those which emerged late. Williams, Godfrey, and Thompson (1951) reported that New Hampshire chicks from the first half of the hatching period grew slightly faster than those from the second half. The same authors likewise reported that female chicks predominated during the first half of hatch and male chicks during the later half. With Los Baños Cantonese, more females were observed in the early period of hatch, more males in the later period, and an apparently equal number in the middle period (Fronda and Simon, 1951). Fronda and Infante (1948) noted the same tendency in ducklings.

Williams, Godfrey, and Thompson (1951) found no evident relationship between rapidity of hatching and mortality. On the other hand, Hays (1941) found that early-emerging Rhode Island Red chicks were more viable than late-emerging chicks.

To find out the relation of length of incubation period to growth, mortality, and sex ratio in S. C. White Leghorn chicks raised locally, this investigation was conducted in the Department of Animal Husbandry from January to December, 1952.

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[1] Central Experiment Station Contribution No. 1709. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Animal Husbandry under the direction of Instructor Amado C. Campos.

MATERIALS AND METHODS

Incubation. One thousand two hundred S. C. White Leghorn eggs produced by the College flock were selected for the study. The eggs were weighed the day they were laid. Those weighing 50 grams or more were collected and saved for setting for a period of 10 days. Settings with 420, 445, and 335 eggs were made in January, May, and September, respectively. An electrically operated Buckeye incubator having a capacity of 1350 eggs was used. Close track was kept of incubation temperature and humidity. The eggs were turned regularly. They were tested on the seventh and on the fourteenth day of incubation. Infertile eggs and eggs with dead embryos were removed.

On the expected day of hatching, the incubator was visited frequently to obtain the exact time of emergence of the first bunch of chicks. All the chicks that came out of their shells within the first eight hours of hatch were designated as lot I (early-emerging chicks) and were placed in a small incubator for hardening. Lot II (middle-emerging chicks), formed from hatches during the second eight hours, was separated from the first group and similarly hardened. All normal hatches thereafter were assigned to lot III (late-emerging chicks). Weak chicks that hatched during the last period and those that tried to peep but failed to emerge from their shells were killed and opened for sex determination.

Brooding. All chicks were legbanded and raised in heated battery brooders. Their initial weights and weekly weights up to the twelfth week were taken. The same care and management was given to all lots. When the chicks were fully feathered, they were transferred to unheated battery cages.

The following constituted the ration given to all the lots:

	PARTS BY WEIGHT
Fine rice bran	55
Ground corn	20
Fish meal	20
Copra meal	5
Table salt	1

Finely chopped green feeds were given two times a week. Water, ground shells, and grit were made available to the chicks at all times.

The sex of each bird was recorded. Those that died before outside manifestation of sex were opened for sex determination. Records of mortality and weekly feed consumption of each lot were kept.

DISCUSSION OF RESULTS

Rate of growth. In all the trials conducted, lot I registered the lowest initial weights and lot III, the highest (table 1). The low initial weights of the early-emerging chicks may be explained by the fact that the chicks from all the lots were weighed at the same time

and the chicks hatched early might have used up part of their food reserve, thus causing a slight decrease in their weight before the initial weighing.

The average final weights of the birds show that early-emerging chicks were heavier than the other groups. The difference between lots II and III was only 2.6 grams in favor of lot II. The trend of results in this study is similar to that of William, Godfrey, and Thompson (1951) and of Henderson and Champion (1948).

When the weights of the three lots in the different trials were compared on the twelfth week, trials 1 and 3 placed lot I first, lot II second, and lot III last. The difference between lot II and lot III was small. In the second trial, lot II lagged behind lot III so that lot I was first, lot III second, and lot II last. The low weights in lot II were attributed to roup which attacked lot II birds from the seventh to the ninth week of the experiment.

The average 12-week weights of the birds in the three lots were much higher than those reported by Mondoñedo (1950) for S. C. White Leghorn weanlings and that reported by Molina (1953) for his control lot, but were comparable with those obtained by Kempster (1941). The separate average final weights and numbers of males and females at 12 weeks of age (table 1) show that in all the trials, lot I had always more females than males. Generally, females grow more slowly than males (Ackerson and Mussehl, 1930), but in this study, lot I as a whole was heavier than the other lots because its cockerels and female weanlings grew faster than those of lots II and III.

From the first to the twelfth week, the average rate of growth of any one lot did not markedly vary from the others. The growth curve of the chicks in each of the three trials, except that of lot II in trial 2, followed almost the same pattern, the rate of growth of all the lots increasing progressively from the start to the end of the observation period.

The influence of the time of hatching on the rate of growth of the chicks in this study may be explained by the following statement by Williams *et al.* (1950): "The act of hatching is merely an incident along the long path of growth and development of the chicks. There are a large number of factors affecting growth, such as genes, gene-environmental interactions, maternal characters such as are found in the egg and also environmental effects, which concrete evidence on this point is lacking at present."

Mortality. Lot I had the lowest percentage of mortality, and lot II, the highest (table 2). Mortality rates varied in the different trials conducted; the highest occurred during the first trial and the lowest in the third trial. The high mortality in trial 1 may be partly attributed to the overnight failure of the electric line during the chicks' fourth day of life. The chicks were panicked into crowding and trampling one another. This incident might have affected the

vitality of the chicks so that during the succeeding weeks in this trial, they became susceptible to coccidiosis. Lots II and III were less severely attacked by coccidiosis in trial 2 than in trial 1 from the second to the fifth week. During the later part of trial 2, however, roup became prevalent in all the lots, especially in lot II. The low percentage mortality in trial 3 may be accounted for by the favorable weather and the wider floor space alloted to the chicks. Furthermore, there were comparatively fewer chicks in trial 3 than in the other trials so that more attention could be given to each chick.

It appears that time of hatch does not have any bearing on the viability of chicks and that late-emerging chicks are as viable as early-emerging ones. These findings are contrary to the report made by Hays ((1941).

Sex ratio. Although female chicks always predominated in number over the males in the first eight hours of hatch (lot I), only trial 2 had significantly more females. In the second eight hours of hatch (lot II), almost equal numbers of males and females were obtained in trials 2 and 3, but significantly more males than females were obtained in trial 1. Among the late-emerging chicks (lot III), exactly equal numbers of males and females were obtained in trial 3, but slightly more males than females in trials 1 and 2. Except for the results obtained in lot II of trial 1 and lot III of trial 3, the distribution of sex in the different hatching periods tends to conform with reports of similar studies on different breeds of chicks (Williams, Godfrey, and Thompson, 1951; Fronda and Simon, 1951; and Fronda and Infante, 1948).

Feed consumption. The average feed consumption of each bird was practically the same in all the lots. From the start of brooding to the twelfth week, each bird that lived up to the end of the observation period consumed 2.65, 2.49, and 2.50 kilograms of feed in lots I, II, and III, respectively. The slightly greater amount of feed consumed by lot I birds may have been due to their slightly bigger size.

Other observations. It was noted that the eggs set in May required the shortest time to hatch; those set in January required a slightly longer time; and those set in September, the longest. Incubation was longest in September perhaps because it is cooler during this month than in May and January.

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TABLE 1

Average initial and weekly weights of Single Comb White Leghorn chicks as influenced by period of hatching.

AGE IN WEEKS	TRIAL 1			TRIAL 2			TRIAL 3			AVERAGE		
	Lot			Lot			Lot			Lot		
	I	II	III	I	II	III	I	II	III	I	II	III
	grams	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*
Initial	37.3	37.5	38.3	36.7	38.9	38.9	35.3	37.0	37.9	36.6	37.9	38.5
1	41.0	42.0	37.3	51.8	48.2	50.8	54.1	53.9	52.7	48.5	47.6	47.1
2	55.6	58.1	59.6	72.8	62.4	67.0	98.7	99.7	98.5	76.3	72.1	72.8
3	87.8	90.7	91.9	106.9	87.8	92.9	143.7	140.2	137.3	114.2	104.5	104.0
4	128.7	126.6	128.6	145.9	115.3	126.4	198.4	188.9	185.3	159.4	141.5	142.4
5	181.5	170.4	184.4	168.2	136.8	156.9	237.0	242.1	235.2	195.9	180.5	185.5
6	240.7	230.6	244.6	251.0	199.6	236.4	320.9	319.0	320.9	273.6	248.0	263.5
7	301.4	288.0	306.6	312.7	258.0	303.5	416.2	406.1	396.6	347.0	316.4	332.5
8	387.8	367.2	377.4	403.3	339.6	393.5	485.9	484.3	481.0	429.4	397.1	417.0
9	469.7	445.7	446.2	490.3	369.9	476.7	564.5	583.4	577.4	512.8	468.4	505.4
10	562.5	525.9	510.1	571.8	444.2	558.2	681.6	686.2	675.0	610.1	569.6	585.6
11	651.3	620.9	581.4	667.0	561.9	641.2	772.8	779.2	782.1	702.8		672.7
12	754.6	693.4	671.9	777.2	669.5	721.1	894.5	870.4	868.1	817.3	760.0	757.4
	±30.4	±22.6	±33.9	±14.3	±11.9	±19.1	±15.7	±21.9	±55.7	±8.7	±14.6	±21.1
Males	812.5	725.8	795.0	868.3	684.9	749.0	961.7	931.5	983.3	900.8	803.7	828.0
	±47.3	±28.4	±79.1	±19.6	±50.5	±27.4	±27.6	±32.5	±34.4	±19.8	±25.4	±26.4
(Number)	(8)	(18)	(6)	(12)	(14)	(25)	(18)	(24)	(14)	(38)	(56)	(45)
Females	723.7	659.1	610.4	738.1	658.9	682.6	841.3	811.7	752.9	769.7	720.5	685.3
	±34.9	±24.4	±40.0	±13.5	±17.6	±23.0	±23.5	±24.9	±32.7	±15.3	±16.3	±19.2
(Number)	(15)	(17)	(12)	(28)	(20)	(18)	(22)	(25)	(14)	(65)	(62)	(44)

TABLE 2

Rate of mortality of Single Comb White Leghorn chicks as influenced by period of hatching

ITEM	TRIAL 1			TRIAL 2			TRIAL 3			TOTAL		
	Lot			Lot			Lot			Lot		
	I	II	III	I	II	III	I	II	III	I	II	III
Initial no. of chicks	71	78	50	50	82	68	45	53	28	166	213	146
1 week	12	10	4	0	0	1	2	1	0	14	11	5
2 weeks	22	16	19	0	8	5	1	0	0	23	24	24
3 weeks	4	5	2	0	3	5	0	0	0	4	8	7
4 weeks	3	3	4	0	4	5	1	1	0	4	8	9
5 weeks	6	1	1	0	5	4	0	0	0	6	6	5
6 weeks	1	5	2	0	1	2	1	0	0	2	6	4
7 weeks	0	0	0	0	1	0	0	0	0	0	1	0
8 weeks	0	1	0	0	2	0	0	0	0	0	3	0
9 weeks	0	0	0	2	7	0	0	0	0	2	7	0
10 weeks	0	1	0	2	17	1	0	1	0	2	19	1
11 weeks	0	1	0	1	0	0	0	1	0	1	2	0
12 weeks	0	0	0	5	0	2	0	0	0	5	0	2
Total	48	43	32	10	48	25	5	4	0	63	95	57
Percentage mortality	67.6	55.1	64.0	20.0	58.5	36.8	11.1	7.5	0.0	38.0	44.6	39.0

TABLE 3

Sex distribution according to the sequence of hatch in Single Comb White Leghorn chicks

ITEM	TRIAL 1			TRIAL 2			TRIAL 3			TOTAL BIRDS OBSERVED
	Lot			Lot			Lot			
	I	II	III	I	II	III	I	II	III	
	M | F	M | F	M | F	M | F	M | F	M | F	M | F	M | F	M | F	M | F
Observed [a]	32 | 39	53 | 34	39 | 31	17 | 33	43 | 41	42 | 39	20 | 26	27 | 28	17 | 17	290 | 288
Expected	35.5 | 35.5	43.5 | 43.5	35 | 35	25 | 25	42 | 42	40.5 | 40.5	23 | 23	27.5 | 27.5	17 | 17	289 | 289
X^2 [b]	0.7331	4.1494[c]	0.9143	5.1200[c]	0.0476	0.1111	0.7826	0.0180	0	0.0069
Percentage of males	45.07	60.92	55.71	34.00	51.19	51.85	43.48	49.09	50.00	50.17

[a] Thirty weak chicks and 23 chicks that peeped but did not emerge were included.
[b] Tabular value equals 3.841.
[c] Significant.

THE GRAFT AFFINITY OF THE FIG, FICUS CARICA, WITH SOME OF ITS CONGENERS [1]

EUGENIO DE LA CRUZ, JR., AND LEON G. GONZALEZ

WITH TWO TEXT FIGURES

The medium-aged cuttings of the fig, *Ficus carica* Linn., gave the highest percentage of rooting in the adobe-glass-frame test; the softwood cuttings, in the hormone-treatment test. Of the four methods of propagation by cuttings, the bottom-heat treatment, with 76 per cent, gave the highest percentage of rooting. It required only 5 days for the roots to start forming in the bottom-heat test, but from 14 to 16 days in the other tests. Only 3 of the 12 species of *Ficus* tested for graft affinity with *Ficus carica* proved compatible: *F. hauili*, *F. odorata*, and *F. ampelos*. These species appeared to be resistant to fig borers, as well as tolerant to other adverse conditions. The results are promising enough to merit further study.

Species of *Ficus* and near-relatives of the fig, *Ficus carica* Linn., abound in the Philippines (Merrill [2]; Brown [3]), but the fig has not gained the permanence that other more recently introduced fruit plants now enjoy. Since most of the difficulties in fig growing seem to be of root origin, finding the congenial stocks among those which have thrived well locally is an important step in the solution of the problem. As a matter of fact, even in California and other centers of fig culture, the continuous search for better stocks has never diminished in intensity (Condit and Swingle).[4]

To find out the suitability of the fig to propagation by stem cuttings preparatory to the raising of scion materials for inarching and to determine the graft affinity of the fig with some of its congeners, this study was conducted in the pomology nursery of the Department of Agronomy from December, 1951, to March, 1953.

MATERIALS AND METHODS

Plant materials. The fig plants used were grown from stem cuttings which had been secured from Cebu through the provincial agents [5] of the Bureau of Plant Industry. The first group of cuttings was planted on December 2, 1951, and the second group, six

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[2] E. D. Merrill, "An Enumeration of Philippine Flowering Plants," Bureau of Printing, Manila, 1923, Vol. 2, 530 pp.

[3] W. H. Brown, *Dept. Agric. Com. Tech. Bull. 10* (1941).

[4] I. J. Condit and W. T. Swingle, "The Fig," The Chronica Botanica, Waltham, Mass., 1947, 222 pp.

[5] Messrs. Victorino Reynos and Juan Corales of Cebu contacted the agricultural agents and shipped the cuttings to the College.

days later. For stocks, seedlings of various ages and sizes of the following congeners of the fig were used: (1) *Ficus conora* King, (2) *F. hauili* Blco., (3) *F. irisana* Elm., (4) *F. nervosa* Heyne, (5) *F. nota* (Blco.) Merr., (6) *F. odorata* (Blco.,) Merr., (7) *F. pubinervis* Blm., (8) *F. ulmifolia* Lam., (9) *F. ampelos* Burm., (10) *F. manilensis* Warb, (11) *F. calophylloides* Elm., and (12) *F. ribes* Blm. Most of these were gathered in the campuses of the Colleges of Agriculture and Forestry.[6] The plants were carefully balled from their habitat, planted close to the sides of suitable pots, and placed under partial shade in the nursery until they were established enough for inarching. The trials were run in duplicate.

Method of grafting used. Inarching was preferred to the other methods of grafting because it is more dependable and requires less exacting selection of plant materials as regards size of the stem and condition of growth. Inarching also allows the longest time possible for union to take place because the incised portions are supported by their own root systems.

After the plant materials had been matched according to size, each pot containing the scion was tied with a piece of wire to another pot containing the stock. Incisions, five to eight centimeters long, were then made on the sides of the scion and the stock. About one-half of the thickness of each stem was cut out. The incised portions were made to coincide and then the stems were tied snugly together with waxed cotton twine. To minimize loss of moisture, the pots were placed in a shaded concrete compartment and were covered with soil. The plants were labeled, watered from time to time, and given necessary care.

Severing and aftercare. When the plants had shown marked signs of union, the scions were severed below the point of attachment with the stocks, and the stocks, above the point of union. Some inarches were allowed to remain uncut for as long as five months. The wounds were painted with a mixture of kerosene and melted asphalt to prevent excessive loss of sap and to minimize fungus and bacterial infections, and the leaves were pruned to half their size to reduce transpiration. Then the severed inarches were retained in the partial shade where they were watered regularly. When the inarches had assumed normal growth, biweekly measurements of growth were taken for 10 weeks.

EXPERIMENTS AND RESULTS

Propagation by stem cuttings

Adobe-glass-chamber test. Fig cuttings, four to five inches long, were grouped according to age or position on the branch. After they

[6] Professor Calixto Mabesa, of the College of Forestry, identified and helped secure most of the stocks used.

had been planted in seedboxes with fine river sand as the rooting medium, they were placed in a glass-covered adobe frame.

In this test, the highest percentage of rooting was obtained in the medium-aged cuttings (table 1). The computed mean value for number of roots was highest in the medium-aged cuttings; the L.S.M.D. for the number of roots was 4.27 (table 2a). Similarly, the medium-aged cuttings had the longest roots; the L.S.M.D. for the length of roots was 2.03 (table 2b).

Hormone-treatment test. Some of the cuttings were soaked for 24 hours in 200 ppm. solutions of indolebutyric acid and naphthaleneacetic acid before they were planted in seedboxes. The cuttings were also grouped according to age or position on the branch.

The highest percentage of rooting in this test was obtained with the first flush, or softwood cuttings (table 1). The difference between the results of this test and those of the adobe-glass-chamber test might have been due to the greater effect of the hormone on the middle part than on the other portions of the cuttings. Another factor which might have caused the variation was the diseases that infected the cuttings.

Slight differences in length of roots were noted among the cuttings of different ages treated with naphthaleneacetic acid and indolebutyric acid (table 3a). The naphthaleneacetic-acid treatment resulted in an increased number of roots, with the medium-aged cuttings showing the greatest increase (table 3b).

Bottom-heat test. A seedbox electrically heated at the bottom [7] was used in this test. Heat was provided day and night until the cuttings completely rooted. In this test, the influence of age of wood on rooting was not studied because of lack of cuttings and the small size of the electrically heated seedbox.

Comparison of treatments. Of the treatments used in the germination of the fig cuttings, the bottom-heat test, with 76 per cent, gave the highest percentage of successful rooting (table 4). This conclusion should be taken with some mental reservation because the different treatments were done at different times with varied replications. It is interesting to note, however, the accelerating influence of bottom heat on root formation. Whereas in the other tests the cuttings began to form roots in 14 to 16 days, those in the bottom-heat test required only five days. Unfortunately, the number of cuttings that could be assembled did not always permit the planning of experiments according to a statistical design.

Graft affinity of the fig with the stocks used

Of the 12 species of *Ficus* tested, only three, *F. hauili* Blco., *F. odorata* Merr., and *F. ampelos* Burm., proved graft-compatible (figs. 1 and 2). A complete description of these species is given by Mer-

[7] Constructed by Mr. Lauro A. Ynalvez of the Department of Chemistry.

Fig. 1.—First replication of stocks with union: (A) *Ficus carica,* (B) *F. hauili,* (C) *F. odorata,* and (D) *F. ampelos.*

Fig. 2.—Second replication of stocks with union: (A) *Ficus carica,* (B) *F. hauili,* (C) *F. odorata,* and (D) *F. ampelos.*

rill.[8] Most of the inarches showed distinct callus formation along the points of incision, with both stocks and scions remaining in vigorous condition until the inarches were severed three months after—a duration considered long enough to insure union if the plants were at all compatible. Marked signs of failure, ranging from almost instant wilting and subsequent drying-up of the severed scions to a more gradual yellowing of leaves and progressive desiccation of the grafts, were exhibited by the species that did not unite upon severance.

The weekly increases in height and in number of leaves of the living grafts may be attributed to the influence of the stocks used (table 5a). On the basis of total increase in height during the 10-week observation period, growth of the fig grafts on *F. odorata* and on *F. ampelos* was more than twice that of growth on *F. carica* or on *F. hauili* (table 5b).

Observations on pests and diseases

Root knot, which is known to cause great damage to the roots of figs, was not found on the experimental plants. Fly maggots and the larvae of a beetle were observed on the roots, but they did not cause any destructive effect on the plants.

Fusarium sp. and *Diplodia* sp. were found attacking the stems, and *Gleosporium* sp., the leaves.[9] These fungi were mainly responsible for the mortality among the rooted cuttings. *Pythium debaryamum* Hesse was found in the soil, but it seemed to cause no destructive effect.

DISCUSSION

The results obtained from the leaf counts were difficult to interpret because not many leaves were formed and the differences in number of leaves were rather small. Perhaps if leaf area or weight had been used instead of number, a clearer indication of growth response might have been observed.

For the grower's purpose, a more vigorous stock than the original root would be preferable. Although the trials were done only in duplicate, the results so far obtained with *F. odorata* and *F. ampelos* are already sufficiently promising to deserve a more intensive study. Furthermore, casual observation of the species in question seems to indicate resistance to fig borers as well as tolerance to other adverse conditions since the species grow well even in the wild state.

[8] E. D. Merrill, "Flora of Manila," 1948. (Mimeographed).

[9] All fungi were identified by Dr. Faustino Orillo of the Department of Plant Pathology.

TABLE 1

Influence of age of wood on percentage of rooting in fig cuttings

POSITION OF BRANCH OR AGE OF CUTTINGS	ADOBE-GLASS-CHAMBER TEST			HORMONE-TREATMENT TEST			TOTAL NO. OF CUTTINGS USED	AVERAGE PERCENTAGE OF ROOTING
	No. of cuttings used	No. of cuttings rooted	Percentage of rooted cuttings	No. of cuttings used	No. of cuttings rooted	Percentage of rooted cuttings		
First flush, or softwood	63	38	60.32	30	17	56.66	93	59.14
Second flush, or medium-aged	63	44	69.84	30	12	40.00	93	60.22
Third flush, or oldwood	63	34	53.97	30	9	30.00	93	46.24

TABLE 2a

Influence of age of wood on fig cuttings grown in glass-covered frame (Based on number of roots)

CUTTING NO.	BASE	MIDDLE	TIP
1	8	10	8
2	4	20	3
3	5	11	7
4	4	12	5
5	2	9	8
Total	23	62	31
Mean	4.6	12.4	6.2

Analysis of variance

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULAR F	
					5%	1%
Position	2	169.73	84.87	8.84	3.88	6.93
Roots within position	12	115.20	9.60			
Total	14	284.93				

L.S.M.D. = 4.27

TABLE 2b

Influence of age of wood on fig cuttings grown in glass-covered frame (Based on length of roots)

CUTTING NO.	BASE	MIDDLE	TIP
	cm.	*cm.*	*cm.*
1	4.5	6.5	3.2
2	2.7	8.0	4.3
3	6.4	3.5	2.5
4	3.3	7.6	1.5
5	4.5	5.3	2.2
Total	21.4	30.9	13.7
Mean	4.3	6.2	2.7

Analysis of variance

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULAR F	
					5%	1%
Position	2	29.69	14.85	6.88	3.88	6.93
Roots within position	12	25.97	2.16			
Total	14	55.66				

L.S.M.D. = 2.03

TABLE 3a

Influence of age of wood and treatment with hormone solution on the rooting of fig cuttings grown in open seedboxes (Based on length of roots)

CUTTING NO.	BASE		
	Naphthaleneacetic acid	Indolebutyric acid	Water
	cm.	*cm.*	*cm.*
1	6.5	10.2	0.7
2	6.5	7.2	0.9
3	2.4	6.1	3.7
4	2.4	9.7	5.3
5	—	3.9	13.1
6	—	2.7	2.4
7	—	—	8.6
Total	17.8	39.8	34.7
Mean	4.5	6.6	5.0
	MIDDLE		
1	7.1	8.9	2.7
2	5.9	7.6	0.4
3	4.3	3.6	8.8
4	3.6	—	8.3
5	—	—	7.4
Total	20.9	20.1	28.6
Mean	5.2	6.7	5.7
	TIP		
1	1.5	1.0	9.3
2	4.1	7.1	0.1
3	—	—	15.0
4	—	—	4.1
5	—	—	0.9
Total	5.6	8.1	29.4
Mean	2.8	4.1	5.9

TABLE 3b

Influence of age of wood and hormone treatment on the rooting of fig cuttings grown in open seedboxes (Based on number of roots)

CUTTING NO.	BASE		
	Naphthaleneacetic acid	Indolebutyric acid	Water
1	16	18	4
2	25	8	5
3	9	6	8
4	3	7	5
5	—	6	19
6	—	10	8
7	—	—	5
Total	53	55	54
Mean	13.3	9.2	7.7
	MIDDLE		
1	18	3	4
2	24	4	4
3	20	12	10
4	15	—	23
5	—	—	8
Total	77	19	49
Mean	19.3	6.3	9.8
	TIP		
1	9	2	3
2	15	8	1
3	—	—	4
4	—	—	1
5	—	—	2
Total	24	10	11
Mean	12.0	5.0	2.5

TABLE 4

Influence of the different treatments on the germination of fig cuttings

TREATMENT	NUMBER OF CUTTINGS USED	MEAN SOIL TEMPERATURE	MEAN LENGTH OF ROOTS	MEAN NO. OF ROOTS	NO. OF DAYS BEFORE LEAVES APPEARED	NO. OF DAYS BEFORE FIRST SIGN OF ROOTING	PERCENTAGE OF ROOTED CUTTINGS
		°C.	cm.				
1. Adobe-glass-frame test	189	25.30	4.40	7.73	11	16	61.37
2. Hormone-treatment test	90	27.40	5.35	11.33	8	14	42.22
3. Bottom-heat test	25	31.90	1.78	4.47	3	5	76.00
4. Water test	30	27.40	4.45	6.71	10	16	56.66

TABLE 5a

Mean weekly height[a] and number of leaves of figs on different stocks

WEEK	*Ficus carica* Linn.		*Ficus havili* Blco.		*Ficus odorata* Merr.		*Ficus ampelos* Burm.	
	Height	No. of leaves	Height	No. of leaves	Height	No. of leaves	Height	No. of leaves
	cm.		*cm.*		*cm.*		*cm.*	
1	50.80	3.0	55.50	0.5	29.90	3.0	44.90	1.0
2	60.00	3.5	56.70	0.5	37.30	3.0	47.40	1.5
3	61.75	3.5	60.15	1.5	43.05	3.5	48.90	3.0
4	62.55	3.5	62.30	2.5	44.15	5.0	54.85	3.5
5	63.23	4.5	64.50	3.5	47.05	5.5	60.00	5.0
6	63.28	4.5	66.95	4.0	51.70	6.0	63.00	5.5
7	64.85	4.8	69.35	4.8	56.65	6.5	69.50	6.5
8	67.00	4.8	72.15	6.0	65.40	8.0	75.30	7.0
9	68.35	3.5	75.00	7.0	71.65	8.5	81.50	8.0
10	69.55	3.5	77.40	8.0	78.95	9.5	87.35	8.5

[a] Each value is the average of two replications.

TABLE 5b

Weekly increase in height of figs on different stocks

WEEK	*Ficus carica* Linn.		*Ficus havili* Blco.		*Ficus odorata* Merr.		*Ficus ampelos* Burm.	
	Height	No. of leaves	Height	No. of leaves	Height	No. of leaves	Height	No. of leaves
	cm.		*cm.*		*cm.*		*cm.*	
2	9.20	0.5	1.20	0.0	7.40	0.0	2.50	0.5
3	1.75	0.0	3.45	1.0	5.75	0.5	1.50	1.5
4	0.80	0.0	2.15	1.0	1.10	1.5	5.85	0.5
5	0.68	1.0	2.20	1.0	2.90	0.5	5.15	1.5
6	0.05	0.0	2.45	0.5	4.65	0.5	3.00	0.5
7	0.57	0.3	2.45	0.8	4.95	0.5	6.50	1.5
8	2.15	0.0	2.85	1.2	8.75	1.5	5.80	0.5
9	1.35	1.3	2.85	1.0	6.25	0.5	6.20	1.0
10	1.20	0.0	2.40	1.0	7.30	1.0	5.85	0.5
Average weekly increase	1.98	0.05	2.44	.83	4.89	0.72	4.71	0.83
Total increase in height after 10 wks., centimeters	18.75		21.90		49.05		42.45	

THE PERFORMANCE OF FIVE VARIETIES OF KENAF[1]

DEMETRIO G. BAQUE

WITH TWO TEXT FIGURES

Among five kenaf varieties, *simplex* had the highest percentage of germination. For both seed and fiber production, *simplex* and *viridis* flowered and matured the earliest, followed by *vulgaris* and *ruber*. *Purpureus* was the latest to flower and mature. All the varieties were attacked by blight of kenaf caused by *Phoma sabdariffae* Sacc. *Purpureus* was more susceptible to *Sclerotium rolfsii* Sacc. than the other varieties. *Simplex* was the tallest of all the varieties and produced the most capsules. *Purpureus* produced the greatest number of branches.

In yield of dry fiber, the differences among the varieties were not significant, but in yield of dry seeds, the differences were significantly in favor of *simplex*. *Simplex* had significantly stronger fiber than any of the other varieties.

Given the same cultural treatment and environmental conditions, *simplex*, *vulgaris*, and *viridis* varieties should be preferred to *purpureus* and *ruber* for commercial planting. Further studies of these three varieties for large-scale production of fiber and seeds should be made.

Five distinct varieties of kenaf, *viridis*, *vulgaris*, *ruber*, *purpureus*, and *simplex*, have been grown and observed in the College of Agriculture. They differ in the color of their stems and petioles, in the shape of their leaves, and in some other less important characteristics (figs. 1 and 2). Crane and Acuña (1945)[2] reported that perhaps the most comprehensive botanical investigations on the species *H. cannabinus* were made by Howard and Howard in India in 1911 when they differentiated five varieties of kenaf comprising eight agricultural types.

As kenaf is naturally self-pollinated, it may easily be improved by the plant-to-row method of selection. The performance of the above-mentioned five varieties of kenaf with emphasis on their yields of fiber and seeds was therefore studied from December, 1951, to March, 1953, in the Division of Fiber and Oil Crops, Department of Agronomy. The height of the plants, appearance of first flower bud, length of growth period, branching, number of capsules to a plant, height of the first flowering node, length of stems, and resistance to pests and diseases were observed.

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[1] Central Experiment Station Contribution No. 1711. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Agronomy under the direction of Associate Professor Pedro A. David.

[2] J. B. Crane and J. B. Acuña, *Bot. Gaz.*, **106**, 344 (1945).

MATERIALS AND METHODS

Germination tests. The percentage of seed germination of each variety was determined in the laboratory by planting 100 seeds of each variety in properly labeled seedboxes on May 7, 1952. The seedboxes were placed out in the open and watered occasionally. Seven days later, when germination was complete, the number of sprouted plants of each variety was counted.

Fig. 1.—Varieties of *Hibiscus cannabinus* with entire leaves: A, *viridis;* B. *simplex.* (*Photographed by Dr. Julian Banzon of the Photographic Division, College of Agriculture.*)

Planting. On May 27, 1952, seeds of the five varieties of kenaf produced in the College of Agriculture Experiment Station were planted with a hand drill in a well-prepared, well-drained field of clay loam. The seeds from individual plants were planted in separate rows. Four rows of each variety were planted for seed production and four, for fiber production. The seeds for seed production were planted 20 × 2 inches apart and those for fiber production, 8 × 2 inches. A planting line and a stick marked with the desired distances were used during the drilling to maintain uniform distances between hills.

Weeding and cultivation. The plots were weeded and cultivated with a trowel when the plants were 21 days old and again when they

were 40 days old. The field was thoroughly hand-weeded whenever necessary.

Observation of subsequent growth and development of the plants. The rate of growth, vigor, color of stems and petioles, shape of leaves, and stand of the plants were observed every week from the time of germination up to maturity. Observations were also made on the flowering habits and maturity of the different varieties during the reproductive stage.

Control of pests and diseases. To control the ants found eating the newly sown seeds, the plots were sprayed with a solution of nine grams of "Gesarol" [3] powder dissolved in a gallon of water.

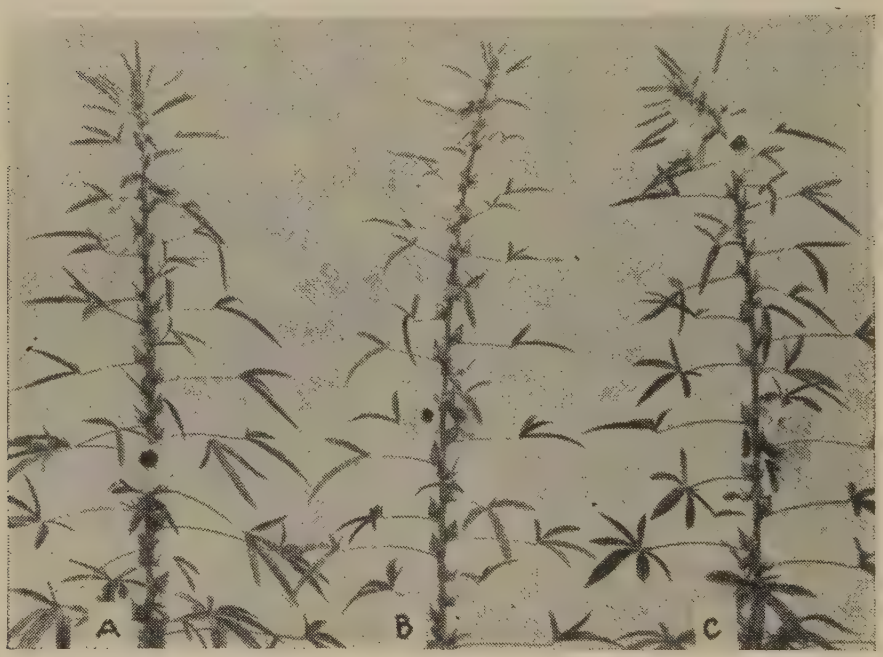

Fig. 2.—Varieties of *Hibiscus cannabinus* with divided leaves: A, *purpureus;* B, *ruber;* C, *vulgaris.* (*Photographed by Dr. Julian Banzon of the Photographic Division, College of Agriculture.*)

Measurement of the plants. When the plants were 120 days old, the heights of 20 representative plants of each variety selected at random from every row were measured. The height of the first flowering node was measured 138 days after planting. Just before harvesting, the heights of 20 representative plants (five from each of four rows) of each variety and the heights of the first flowering

[3] Recommended and supplied by Dr. G. B. Viado of the Department of Entomology.

nodes were measured. The number of branches on each representative plant was counted.

Harvesting. The plants for fiber were cut at ground level at the blooming stage. Five representative plants from each row were bundled separately from the rest of the plants within the same row and labeled. The freshly harvested stalks from each row were weighed. The leaves were then removed and the lengths of the stems measured. Afterwards, the defoliated stems were weighed. Ribbons obtained from the defoliated stalks were also weighed, tied into bundles, tagged, and then submerged in running water to ret for 11 to 21 days. The pulp adhering to the fibers was removed by washing. The wet fibers were weighed and dried in the sun to a constant weight. Finally, the dried fibers were weighed. The percentages of the component parts were computed on the basis of the fresh weight of the undefoliated stalks.

The plants for seed production were harvested when the four lower capsules on about 80 per cent of them in the field were mature. The sample plants in each row were cut with pruning shears 3 centimeters below the first-borne capsule. The harvested sample plants were placed inside paper bags with their tags. The capsules were then threshed. The seeds were winnowed, dried in the sun, and finally weighed.

Determination of tensile strength. Fiber samples were taken from the 20 representative plants of each variety and selected according to length, softness, brightness, and luster. Two single-fiber strands for testing were taken from each sample length of 1.5, 2.0, and 2.5 meters of each variety. The single-fiber strands were tested on a Scott Testers IP-2 Tensilgraph machine.

The tensile strength expressed in breaking length was computed by using the following formula of Botkin, Shires, and Smith (1943):

$$\text{Tensile strength} = \frac{\text{Breaking load}}{\text{Weight of sample per centimeter}}$$

RESULTS AND DISCUSSION

Germination and external appearance of the plants. Variety *simplex* had a fairly high percentage of germination (table 1). *Viridis, ruber, purpureus,* and *vulgaris* did not germinate as well. It took from 5 to 7 days for the kenaf seeds to germinate in the field. During the early stage of their growth, the kenaf plants were uniform in height and were green and vigorous. Towards maturity, however, *simplex* became more vigorous and more uniform in height than the other varieties. Marked differences in height of plants, color of stems and petioles, and shape of leaves were noted six weeks after planting.

Susceptibility to diseases and pests. Ants were found eating the newly sown seeds. The following insect pests also attacked the plants: (1) *Nisotra gemella* Erichson, (2) *Tectocoris diopthalmus* (Thunberg), and (3) *Dysdercus megalopygus* Breddin.[4] Although these insects appeared to be fond of kenaf, they did not damage the plants extensively.

All the varieties were apparently susceptible to blight of kenaf caused by *Phoma sabdariffae* Sacc.[5] About 50 per cent of the plants were infected with the disease. The variety *purpureus* was infected with *Sclerotium rolfsii* Sacc.

Ages of blooming and maturity. *Simplex* and *viridis* required the shortest time to come to full flowering. *Ruber* and *vulgaris* came next and *purpureus* flowered last.

For seed production, *simplex* matured earliest. *Viridis, ruber,* and *vulgaris* matured at about the same time, 184 days after the time of planting. *Purpureus* was the last to mature.

Height of plants. In both fiber and seed plots after 120 days, *simplex* was significantly taller than the other varieties (table 2).

Branching of plants. *Purpureus,* when planted for fiber or for seed, produced the greatest number of branches (table 2). The differences in number of branches among the other four varieties were not significant.

Number of capsules. *Simplex* produced the most capsules to a mature plant, followed by *viridis* (table 2). *Purpureus* gave significantly more capsules than either *vulgaris* or *ruber.*

Height of first flowering nodes. In mean height of the first flowering nodes measured when the plants were 138 days old, there was a significant difference between *simplex* and *ruber* in the seed plots and between *simplex* and *vulgaris* in the fiber plots (table 2). *Viridis* was significantly taller than *ruber* in height of first flowering node.

Length of stems. Simplex produced significantly longer stems than *ruber, purpureus,* and *vulgaris* but not longer than *viridis* (table 2). *Viridis* gave the highest mean percentage of extraction (based on dry-fiber weight), followed by *vulgaris, ruber, simplex,* and *purpureus* in descending order.

Yield. Although *simplex,* the highest yielder of fiber, produced about twice as much as *ruber,* the lowest yielder, the differences in yield among the five varieties were not statistically significant (table 3). In yield of dry seeds *simplex* was the highest, followed by *viridis* and *purpureus* (table 4). *Vulgaris* and *ruber* gave the least yields.

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[4] All insects were identified by Dr. Silverio M. Cendaña of the Department of Entomology.

[5] The diseases mentioned in this study were identified by Dr. Faustino T. Orillo of the Department of Plant Pathology.

The low yields of seeds may have been caused by the strong winds and rains which occurred when the plants were in bloom.

Analysis of fresh stalks. The weights and percentages of the various constituents of the fresh, undefoliated stalks of the five varieties showed that *purpureus* was the heaviest, followed in the descending order by *simplex, ruber, vulgaris,* and *viridis* (table 5). In percentage of dry fiber, the different varieties were arranged in the following order: *viridis, vulgaris, ruber, simplex,* and *purpureus.* Although the fresh stalks of *viridis* and *vulgaris* weighed the least among the five varieties, they had high percentages of fiber. On the other hand, despite the heavy weight of the fresh stalks of *purpureus* and *simplex,* their percentages of fiber were the lowest.

Tensile strength. Simplex had a significantly higher tensile strength expressed in breaking length of the fiber than any of the other four varieties studied (table 6).

TABLE 1

Percentage of germination and mean number of days from planting to blooming and maturity of five kenaf varieties

VARIETY	GERMINATION [a]	DATE PLANTED	DATE FLOWERED	FLOWERING TIME AFTER DATE OF PLANTING	DATE HARVESTED		DAYS FROM PLANTING TO MATURITY	
					For fiber	For seed	For fiber	For seed
	per cent	*1952*	*1952*		*1952*	*1952*		
Simplex	81	May 27	Sept. 18	114–145	Oct. 19	Nov. 20	145	177
Viridis	78	"	Sept. 19	115–145	"	Nov. 27	145	184
Ruber	57	"	Sept. 21	117–150	Oct. 24	"	150	184
Purpureus	62	"	Sept. 25	121–162	Nov. 5	Dec. 7	162	194
Vulgaris	56	"	Sept. 20	116–150	Oct. 24	Nov. 27	150	184

[a] Based on 100 kenaf seeds to a variety.

TABLE 2

Mean values of the quantitative characters measured in the different varieties
(Based on five plants to a row and four rows to a variety)

VARIETY	MEAN HEIGHT OF PLANTS AT 120 DAYS OF AGE		NUMBER OF BRANCHES TO A PLANT		NUMBER OF CAPSULES TO A PLANT	MEAN HEIGHT OF THE FIRST FLOWERING NODE AT 138 DAYS OF AGE		MEAN LENGTH OF HARVESTED STEMS
	For fiber	For seed	For fiber	For seed		For fiber	For seed	
	cm.	*cm.*				*cm.*	*cm.*	*cm.*
Simplex	317.8 ± 9.82	303.3 ± 9.56	6.40 ± 2.11	9.45 ± 3.15	34.80 ± 6.31	247.5 ± 5.16	245.2 ± 5.24	303.3 ± 8.68
Viridis	282.8 ± 10.40	263.7 ± 10.48	3.75 ± 1.65	9.15 ± 3.23	26.35 ± 2.48	237.1 ± 6.94	222.0 ± 5.93	279.7 ± 8.60
Ruber	252.2 ± 10.59	227.7 ± 10.91	5.40 ± 1.33	8.25 ± 2.33	14.45 ± 1.06	202.6 ± 10.31	198.8 ± 6.47	235.8 ± 9.38
Purpureus	270.9 ± 11.20	237.8 ± 14.52	10.00 ± 2.75	11.40 ± 2.26	19.25 ± 1.57	237.8 ± 5.70	212.5 ± 8.50	260.7 ± 11.81
Vulgaris	248.3 ± 17.24	213.8 ± 10.30	4.40 ± 1.70	7.80 ± 1.55	14.70 ± 2.02	213.8 ± 4.91	181.9 ± 7.80	252.2 ± 14.09

TABLE 3

Yield in grams of dry fiber to a row of five kenaf varieties

VARIETY	REPLICATION				TOTAL	MEAN
	1	2	3	4		
Simplex	736.1	370.4	277.3	382.9	1766.7	441.68
Viridis	157.9	238.8	194.2	525.4	1116.3	279.08
Ruber	116.6	244.4	198.4	379.8	939.2	234.80
Purpureus	418.0	347.6	121.0	135.7	1022.3	255.58
Vulgaris	425.8	437.9	377.2	292.0	1532.9	382.23

Analysis of variance

SOURCE OF VARIATION	DF	SUM OF SQUARES	VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE	
					5%	1%
Varieties	4	127521.19	31880.30	1.48	3.06	4.89
Error	15	323329.65	21555.31			
Total	19	450850.84				

TABLE 4

Yield in grams of dry seeds to a row of five kenaf varieties

VARIETY	REPLICATION				TOTAL	MEAN
	1	2	3	4		
Simplex	17.9	18.7	18.6	18.1	73.3	18.33
Viridis	11.1	11.1	10.6	11.1	43.9	10.98
Ruber	7.3	7.1	6.8	6.8	28.0	7.00
Purpureus	8.9	9.1	8.7	8.5	35.2	8.80
Vulgaris	7.5	6.9	8.0	7.7	30.1	7.53

Analysis of variance

SOURCE OF VARIATION	DF	SUM OF SQUARES	VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE	
					5%	1%
Varieties	4	341.78	85.45	776.82	3.06	4.89
Error	15	1.66	0.11			
Total	19	343.44				

L.S.M.D. = 0.50

TABLE 5

Weight and percentage of fresh stalk constituents of five kenaf varieties [a]

CONSTITUENT	SIMPLEX		VIRIDIS		RUBER		PURPUREUS		VULGARIS	
	gram	*per cent*	*gram*	*per cent*	*gram*	*per cent*	*gram*	*per cent*	*gram*	*per cent*
Fresh stalks	2825.00	100.00	1825.00	100.00	2250.00	100.00	4400.00	100.00	2175.00	100.00
Leaves and flowers	850.00	30.09	425.00	23.29	600.00	26.67	1675.00	38.07	475.00	21.84
Defoliated stalks	1975.00	69.91	1400.00	76.71	1650.00	73.33	2725.00	61.93	1700.00	78.16
Defoliated stalks:										
Pith	1295.85	45.87	902.75	49.47	1070.85	47.59	1551.37	35.26	1091.40	50.18
Ribbons	679.15	24.04	497.25	27.25	579.15	25.74	1173.63	26.67	608.60	27.98
Ribbons:										
Pulp (waste)	397.02	14.05	307.20	16.83	372.65	16.56	872.43	19.83	374.07	17.20
Wet fiber	282.13	9.99	190.05	10.42	206.50	9.18	301.20	6.84	234.53	10.78
Wet fiber:										
Moisture	186.88	6.62	114.00	6.25	126.50	5.62	175.37	3.98	144.75	6.65
Dry fiber	95.25	3.37	76.05	4.17	80.00	3.56	125.83	2.86	89.78	4.13

[a] Average of five plants to a row or 20 plants from each variety.

TABLE 6

Tensile strength in kilometers of different lengths of fiber of the different varieties

VARIETY	LENGTH OF SAMPLE						TOTAL	MEAN
	1½ m.		2 m.		2½ m.			
Simplex	10.3	8.3	13.5	10.0	16.0	15.8	73.9	12.32
Viridis	4.2	4.0	7.3	6.7	12.9	10.8	45.9	7.65
Ruber	3.3	4.1	7.2	8.1	8.3	8.3	39.3	6.55
Purpureus	4.4	3.6	5.2	5.6	9.6	8.0	36.4	6.07
Vulgaris	7.4	5.0	7.1	7.3	9.1	10.6	46.5	7.75
Total	29.6	25.0	40.3	37.7	55.9	53.5	242.0	

Analysis of variance

SOURCE OF VARIATION	DF	SUM OF SQUARES	VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE	
					5%	1%
Blocks	2	151.22				
Varieties	4	147.82	36.96	16.43		
B × V	8	18.03	2.25	1.99	3.84	7.01
Sampling Error	15	16.98	1.13			
Total	29	334.05				

L.S.M.D. = 2.00

THE INFLUENCE OF 5 AND 10 PER CENT LEVELS OF IPIL-IPIL (LEUCAENA GLAUCA) LEAF MEAL IN THE COLLEGE ALL-MASH RATION FOR CHICKS [1]

DOMINGO G. MOLINA

The addition of ipil-ipil leaf meal to the College all-mash growing ration greatly improved the feeding value of the basal feed. Of the two levels of ipil-ipil leaf meal used, the 5 per cent level was found to be better.

Ipil-ipil (*Leucaena glauca* Linn.) leaves are gaining in popularity as vegetable feed among local poultry raisers. Fronda and Diñgayan (1950) reported that of the three kinds of fresh green leaves they tested for chicks, namely, ipil-ipil, centrosema (*Centrosema pubescens* Benth.), and sweet potato (*Ipomoea batatas* Linn.), ipil-ipil produced the heaviest chicks and gave the lowest mortality. In Hawaii, Palafox (1948) reported that fresh green koa haole [2] leaves supplemented to alfalfa meal in chick rations had no adverse effect on growth.

Quisenberry (1947) observed similar growth results in birds given 5 per cent level of kao haole leaf meal in the ration and those given the same level of alfalfa meal. Like observations were made in the Araneta Institute of Agriculture by Gapuz (1951). Quisenberry (1947), Burgos and Martin,[3] and Gapuz (1951) noted, however, that the addition of more than 5 per cent level of kao haole or ipil-ipil leaf meal to the ration produced a growth-depressing effect on chicks.

This study was undertaken in the Department of Animal Husbandry from May, 1951, to June, 1952, to determine the influence of 5 and 10 per cent levels of ipil-ipil leaf meal in the College all-mash ration for chicks.

MATERIALS AND METHODS

A total of 369 day-old Single Comb White Leghorn chicks hatched from eggs produced by the College stock was used in three trials which lasted 12 weeks each. The chicks were legbanded and divided

[1] Central Experiment Station Contribution No. 1712. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Animal Husbandry under the direction of Professor F. M. Fronda and Instructor A. C. Campos.

[2] Koa haole is the Hawaiian name for ipil-ipil.

[3] CARLOS X. BURGOS AND RUFINO MARTIN, *Philippine Bureau of Animal Industry Recorder,* [5] 12, 27 (1950).

at random into three lots. The first trial, with 38 chicks in each lot, was conducted from September 13 to November 6, 1951; the second, with 35 chicks in each lot, from November 8, 1951, to January 31, 1952; and the third, with 50 chicks in each lot, from April 7 to June 30, 1952.

The chicks in all the lots were raised indoors in pens each provided with a 1.5 × 1.3-meter sunning yard. During the first four weeks of brooding, a 50-watt bulb was used to heat each of the brooding pens. Built-up rice hull litter was used as flooring material.

The basal ration was the College all-mash growing ration which contains the following ingredients, all parts by weight: rice bran, 55; ground corn, 20; copra meal, 5; and fish meal, 20. Ipil-ipil leaf meal was added to the basal ration of the different lots in the following amounts:

Lot 1 — basal ration, 100; ipil-ipil leaf meal, 0
Lot 2 — basal ration, 95; ipil-ipil leaf meal, 5
Lot 3 — basal ration, 90; ipil-ipil leaf meal, 10

The ipil-ipil leaves [4] used in the study were gathered from one locality in May, 1951. They were carefully dried under the sun and ground. The samples analyzed by the Department of Agricultural Chemistry showed the following composition: moisture—9.07, crude proteins (N × 6.25)—20.78, crude fats (ether extract)—6.38, carbohydrates (NFE)—39.52, calorific value for every 100 grams—299.00, crude fibers—12.57, and ash—11.68.

The feed was given as dry mash. Sufficient amounts of feed and drinking water were made available to the birds at all times. Except for the difference in the rations, all lots received practically the same care and management.

The initial and biweekly individual weights of the chicks, the amount and the cost of feed consumed, and the rate of mortality in each lot for 12 weeks were recorded. The degree of pigmentation was also observed.

RESULTS AND DISCUSSION

Rate of growth. The average biweekly weights of the chicks were used to determine the influence of feed on their rate of growth. The average initial weights of the chicks in the three replications were about the same (table 1). Except in the first two weeks when the birds in lot 3 were a few grams heavier than those in lot 2, the averages of the three trials show that the birds in lot 2 were heavier than those in either lot 1 or lot 3 during the 12-week period of the study.

Marked differences were noticed in the twelfth-week average weights of the birds belonging to the same lot but raised during different months of the year. Lot 2, which was given 5 per cent

[4] Commercial ipil-ipil leaf meal cost 35 centavos a kilogram.

ipil-ipil leaf meal in the ration, showed the highest average twelfth-week weight regardless of the season. Lot 3 (except in trial II) gave the second highest; lot 1, the lowest. The results clearly indicate that the inclusion of 5 and 10 per cent ipil-ipil leaf meal in the College all-mash growing ration improves its growth-promoting value and that the 5 per cent level has better growth-inducing effects than the 10 per cent level. These findings corroborate those reported by Quisenberry (1947), Burgos and Martin,[5] and Gapuz (1951).

Mortality. In all the trials, lot 2 had the lowest mortality rate, and lot 1 the highest. Of 123 chicks used in each lot, 47, or 38.2 per cent, died in lot 1; 28, or 22.8 per cent, in lot 3; and only 16, or 13.0 per cent, in lot 2. The addition, especially at the 5 per cent level, of ipil-ipil leaf meal to the ration generally reduced mortality, probably because the health of the chicks was improved.

In the different trials the death rates varied. A comparison of the over-all mortality figures in all the lots of the different trials shows that the highest death rate occurred during the second trial; the least, in the third trial. The high death rate in trial II was due to the outbreak of ascaris and coccidial infestations in all the lots. An outbreak of the same maladies, but less severe than that in trial II, acounted for most of the deaths in trial I. Favorable weather accounted for the low percentage of mortality in trial III.

In all the lots and in all the trials, the majority of the deaths occurred during the first half of the 12-week observation period. During this time, 33 out of 47 chicks died in lot 1, 12 out of 15 in lot 2, and 22 out of 28 in lot 3. Since the first few weeks in the life of chicks are considered the most critical, this trend of death rates was expected.

Feed consumption and cost. The averages of the three trials show that of the three lots, lot 2 had the highest total feed consumption, followed by lot 1 and lot 3 (table 2). However, on the basis of the average consumption of each bird, lot 1 consumed the greatest amount of feed, lot 2 the next, and lot 3 the least. When the amount of feed required to produce a kilogram gain in weight was considered, lot 2 birds required the least feed, lot 3 birds the next smallest, and lot 1 birds the greatest. Although a kilogram feed cost more in lots 2 and 3, the cost of feed to produce a kilogram gain was more economical in lots 2 and 3 than in lot 1.

These results point to the fact that ipil-ipil leaf meal, when included in the College all-mash growing ration at 5 and 10 per cent levels, lowers cost of production by increasing the efficiency of feed utilization. The 5 per cent level, which gives better results, is more profitable to use.

Degree of pigmentation. Green feeds like ipil-ipil leaf meal are natural sources of carotene which makes the pigment of the

[5] BURGOS AND MARTIN, *op. cit.*

shanks, skin, and feathers of yellow-skinned breeds of fowls more intense (Hall, 1950). In this study, in all the lots fed ipil-ipil leaf meal, the beaks and shanks of the birds were yellower than those of the birds fed the basal ration only. The yellow color was deeper in the birds fed the 10 per cent level than in those fed the 5 per cent level of ipil-ipil leaf meal.

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TABLE 1

Average initial and biweekly weights in grams of White Leghorn chicks

AGE	TRIAL I			TRIAL II			TRIAL III			AVERAGE		
	Lot 1	Lot 2	Lot 3	Lot 1	Lot 2	Lot 3	Lot 1	Lot 2	Lot 3	Lot 1	Lot 2	Lot 3
1 day	34.3	35.8	34.8	34.5	34.4	35.2	36.2	36.4	35.8	35.0	35.5	35.3
2 weeks	52.4	52.8	59.8	68.9	67.4	66.7	55.3	63.9	62.2	58.9	61.4	62.9
4 weeks	93.1	98.2	106.2	137.6	141.2	118.5	147.2	153.5	143.7	126.0	131.0	122.8
6 weeks	188.4	211.8	190.7	197.2	212.9	188.1	284.3	302.3	297.1	223.3	242.3	225.3
8 weeks	350.7	367.8	305.7	305.1	321.8	280.3	411.6	454.5	463.5	359.1	381.3	349.9
10 weeks	445.8	530.0	463.1	421.1	502.3	391.1	569.5	613.9	605.2	475.5	548.7	486.5
12 weeks	609.4	718.7	669.7	594.5	684.8	539.6	750.2	794.6	771.2	651.4	732.7	660.2

TABLE 2

Amount and cost of feed consumed and returns above feed cost

ITEM	TRIAL I			TRIAL II			TRIAL III			AVERAGE		
	Lot 1	Lot 2	Lot 3	Lot 1	Lot 2	Lot 3	Lot 1	Lot 2	Lot 3	Lot 1	Lot 2	Lot 3
Amount of feed consumed, kilograms	106.70	115.80	101.20	80.20	87.50	72.50	174.20	179.9	176.00	120.37	127.73	116.57
Average feed consumption of each bird, kilograms	4.14	3.18	3.32	3.33	3.14	2.79	4.12	3.76	3.90	3.86	3.36	3.34
Average gain in weight of each bird, kilograms	.44	.67	.57	.34	.55	.37	.67	.74	.71	.48	.65	.55
Amount of feed required to produce a kilogram gain, kilograms	5.81	4.72	5.81	9.66	5.75	7.58	6.17	5.06	5.47	6.98	5.18	6.29
Cost of feed consumed, pesos [a]	28.38	31.27	27.73	21.33	23.63	19.85	46.34	48.57	48.25	32.02	34.49	31.94
Cost of feed to produce a kilogram gain, pesos	1.55	1.27	1.59	2.57	1.55	2.08	1.64	1.37	1.49	1.92	1.39	1.72
Returns from sales of weanlings produced, pesos [b]	30.46	66.70	46.88	25.28	41.10	26.96	75.03	92.38	83.83	43.59	66.73	52.56
Returns above feed cost for 100 weanlings, pesos	11.03	98.42	61.76	24.73	66.46	35.63	74.19	90.90	80.69	36.65	84.81	59.36

[a] Cost of a kilogram feed was ₱0.266 for lot 1, ₱0.270 for lot 2, and ₱0.274 for lot 3.
[b] Price of weanlings was ₱2.50 a kilogram live weight.

THE INFLUENCE OF SOIL IN THE COLLEGE RATION FOR GROWING CHICKS [1]

PROSPERO B. PAJARILLAGA

WITH ONE TEXT FIGURE

No marked advantage was gained by supplementing the College all-mash chick ration with 2 per cent soil. The twelfth-week average weight of the control birds was slightly lower than that of the experimental birds. The average rates of mortality in the two lots were practically the same. Based on 100 chicks raised to 12 weeks of age, the returns above cost of feed were a bit higher for the experimental lot than for the control lot.

A study by Ragat [2] showed that outdoor brooding gave better results than indoor brooding with regard to rate of growth, percentage of mortality, and feed consumption. Similarly, Castillo [3] observed that ground-run chicks were slightly heavier than sun-porch chicks.

Investigations conducted by Stephenson, McGinnis, Graham, and Carver [4] showed that soil taken from a lot supposedly free from animal manure, when supplemented in the amount of one per cent to a growing ration containing soybean oil meal as the only protein concentrate, produced a favorable growth response and a low rate of mortality.

As it would be of interest to determine if soil added to the College growing ration and fed to chicks kept indoors would produce favorable results, this study was conducted in the Department of Animal Husbandry from May, 1949, to May, 1950.

MATERIALS AND METHODS

Three hundred forty-two day-old New Hampshire chicks of the College stock were legbanded and divided equally into two lots. Three trials, each covering a period of 12 weeks, were conducted. The first trial was conducted from September 8 to December 1, 1949; the second, from January 13 to April 7, 1950; and the last, from March 1 to May 24, 1950. The chicks in both lots were confined in adjoining concrete pens exposed to morning sunlight. No artificial heat was provided for them. Rice hull was used as litter.

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[1] Central Experiment Station Contribution No. 1713. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Animal Husbandry under the direction of Professor F. M. Fronda and Instructor A. C. Campos.

[2] M. M. RAGAT, *Philippine Agriculturist*, 28, 593 (1937).

[3] L. S. CASTILLO, *Philippine Agriculturist*, 32, 123 (1948).

[4] E. L. STEPHENSON, J. MCGINNIS, W. D. GRAHAM, AND J. S. CARVER, *Poultry Sci.*, 27, 827 (1948).

To the control lot (lot 1) was given the College chick ration which consists of the following ingredients, all parts by weight:

Rice bran	55
Ground corn	20
Fish meal	20
Copra meal	5
Common table salt, 2 per cent of the mash	

The experimental lot (lot 2) received the same basal ration with the addition of 20 grams of finely sieved top soil [5] to every 980 grams of the College chick mash. To both lots the ration was given dry and in sufficient amounts. It was made accessible to the birds at all times. Clean drinking water, ground shells, and grit were supplied the chicks *ad libitum*, and chopped green feed was hand-fed to them daily. Except for the difference in the rations, both lots received practically the same care and management.

The initial and biweekly individual weights of the chicks, the amount and cost of feed consumed, and the rate of mortality were recorded.

RESULTS AND DISCUSSION

Rate of growth. The average weights of the chicks at different ages were used to determine the influence of the feed on their rate of growth. The initial weights of the chicks in both lots in each trial were almost the same. In trial 1, except on the tenth week, lot 1 chicks had consistently higher weights than lot 2 chicks (table 1). At the end of the twelfth week the average weights showed a difference in favor of lot 1 birds.

In trial 2, a somewhat different tendency was observed. The weight advantage of lot 1 over lot 2 was inconsistent. The birds in lot 2 showed a higher average weight than those in lot 1 on the sixth week. At the end of the experiment, however, the lot 1 birds weighed more than the lot 2 birds.

In trial 3, the lot 2 birds weighed more than the lot 1 birds from the eighth week up to the end of the observation period. In the final weighing lot 2 had an advantage over lot 1.

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[5] The soil used in this experiment was taken from a place supposedly free from animal manure and inaccessible to chickens. Its proximate mineral analysis as determined by the Department of Agricultural Chemistry is as follows:

P	P_2O_5	0.018% or 18 mg. per 100 gram sample
Ca	CaO	5.980% or 5,980 mg. per 100 gram sample
Fe	Fe_2O_3	0.720% or 720 mg. per 100 gram sample

Its biological analysis as determined in the Department of Soils is as follows:

Molds	370,000 colonies per gram of soil sample
Bacteria	500,000 colonies per gram of soil sample

In any of the trials, pooled variance analysis was not employed since the individual weight of each chick was not independent from that of the weights of the other chicks. When the weekly averages for the three trials were plotted (fig. 1), it was evident that from the first week up to the later part of the seventh week, the birds in lot 1 weighed more than those in lot 2. From the eighth week till

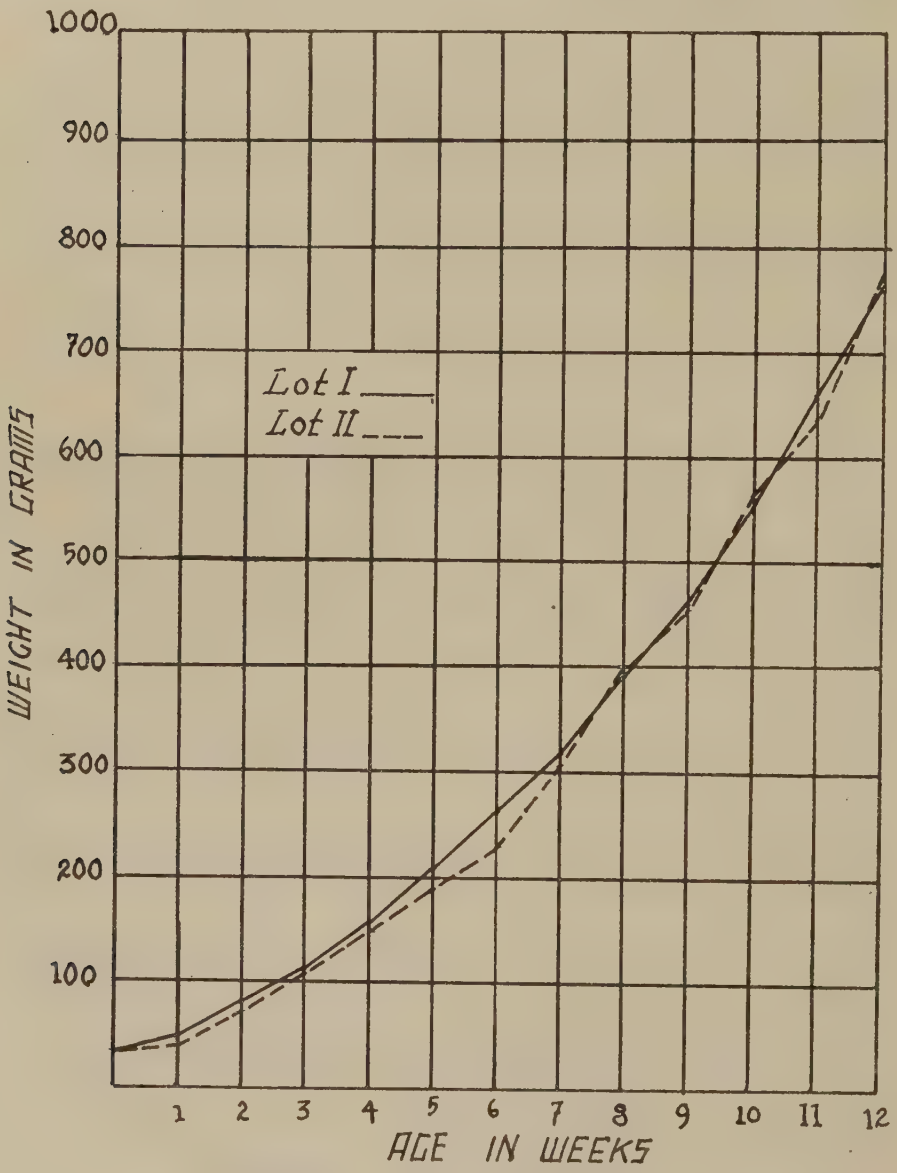

Fig. 1.—Average weekly weights of New Hampshire chicks in both lots.

about the end of the experiment, there was no marked difference in weight between the two lots. However, the average final weight of the birds in the experimental lot was greater by 5.47 grams.

Mortality. In trials I and III the percentage of mortality in lot 2 was slightly lower than in lot 1, whereas in trial II it was slightly lower in lot 1 than in lot 2 (table 2). The apparently high mortality in both lots in trials II and III was largely due to coccidiosis and partly to roup. In both lots in all the trials, high death rates occurred between the first and the fifth week of the study, although some deaths were also noted during the later part of the observation period.

Feed consumption and cost. On the average, the birds in both lots consumed about the same amount of feed (table 3). The soil-supplemented ration, then, was as well relished as the basal ration.

It was observed that the lot 1 chicks needed an average of only 40 grams more feed than the lot 2 birds to produce a kilogram gain in weight (table 3). The high figures obtained in the second and third trials were caused by high mortality and the lightness of the weanlings produced.

Inasmuch as a poultryman is greatly interested in the income he derives from his flock, the returns above cost of feed should be the basis for determining which the better ration is. The actual returns above cost of feed from all the weanlings, the current price of table fowls, and the returns above cost of feed for every 100 weanlings indicate no marked advantage in the use of one ration in place of the other.

TABLE 1

Average initial and biweekly weights in grams of New Hampshire chicks

AGE	TRIAL I		TRIAL II		TRIAL III		AVERAGE [a]	
	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2
1 day	37.9	37.4	41.1	42.8	37.9	37.8	38.6	38.6
2 weeks	94.9	88.7	83.8	84.9	74.9	74.4	83.0	81.4
4 weeks	186.2	173.1	153.5	143.1	146.5	138.8	160.0	152.5
6 weeks	329.8	290.7	214.5	221.2	246.2	187.4	267.4	231.9
8 weeks	514.2	471.4	334.5	330.5	319.3	350.0	391.4	392.8
10 weeks	617.3	619.8	493.9	465.9	528.6	534.4	551.1	552.3
12 weeks	833.2	800.5	709.7	665.6	729.6	779.5	764.1	769.5

[a] Based on total number of birds.

TABLE 2

Rate of mortality

ITEM	TRIAL I		TRIAL II		TRIAL III		TOTAL	
	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2
Number of chicks at start	47	47	35	35	89	89	171	171
Number of chicks that died	17	16	21	22	51	50	89	88
Percentage of mortality	36.2	34.0	60.0	62.9	57.3	56.2	52.0	51.5

TABLE 3

Amount and cost of feed consumed and returns above feed cost

ITEM	TRIAL I		TRIAL II		TRIAL III		AVERAGE	
	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2
Amount of feed consumed, kilograms	103.77	101.72	57.72	53.38	141.13	137.82	100.87	97.64
Cost of feed consumed, pesos [a]	21.69	20.95	12.06	10.99	29.49	28.39	21.08	20.11
Amount of feed requried to produce a kilogram gain, kilograms	4.48	4.41	6.79	7.45	5.79	5.09	5.69	5.65
Cost of feed required to produce a kilogram gain, pesos	.94	.91	1.42	1.53	1.21	1.05	1.19	1.16
Returns from sales of weanlings, pesos [b]	57.80	57.65	21.25	17.90	60.85	67.65	46.63	47.73
Actual returns above cost of feed from all weanlings, pesos	36.12	36.70	9.19	6.91	31.36	39.26	25.56	27.62
Returns above feed cost for 100 weanlings, pesos	120.00	118.00	66.00	53.00	82.00	101.00	89.33	90.00

[a] Cost of a kilogram of feed was ₱0.209 for the control lot and ₱0.206 for the experimental lot.

[b] Price of weanlings was ₱2.50 a kilogram live weight.

CASE REPORT: HOG CHOLERA, PERACUTE FORM[1]

F. S. Mensalvas and G. V. Garcia

Of the three forms of hog cholera or swine fever, the peracute form produces the least noticed symptoms and lesions. Undoubtedly, this is due to the rapid course and termination which characterize this type of the disease. This report is on a case of a peracute form of hog cholera in the swine project of the Animal Husbandry Department, College of Agriculture, University of the Philippines.

SUBJECT

The subject was a Berkshire gilt, about one year of age and weighing 133 kilograms.

HISTORY

The gilt was one of those imported from Japan by the Philippine government with MSA funds during the early part of December, 1952. Upon arrival in the Philippines, it was quarantined with the rest of the shipment at the Bureau of Animal Industry in Pandacan, Manila, where it was given a prophylactic dose of hog-cholera vaccine (ROVAC). It arrived at the Animal Husbandry Department on January 15, 1953. On April 21, 1953, it died after an illness of only a few hours.

SYMPTOMS

The onset of the disease was abrupt. At about 10:00 o'clock a.m. on April 21, 1953, the gilt was seen lying on its dextral side, breathing laboriously. Upon being prodded, it stood up with much difficulty. Weakness of the legs, especially of the hind ones, was observed. Because of dyspnea, the mouth was open. The visible mucous membranes were hyperemic. The rectal temperature was 40.5°C. and there was lack of appetite.

The symptoms were more pronounced by afternoon when the animal could no longer stand up. Frothing at the mouth and occasional scanty bloody discharges from this organ and from the teats were observed. The breathing became faster and more labored, the rate being 82 times a minute. The rectal temperature had increased gradually so that at about 5:30 o'clock p.m., it was 43.3°C. Bluish discolored areas on the tips of the ears, on the jowl, and on the ventral surface of the abdomen were noted. There was also hypersensitivity, shown by the grunts and squeals of the animal when parts of its body, particularly the hind quarters, were palpated.

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[1] Central Experiment Station Contribution No. 1714.

At about 9.00 o'clock p.m., after the administration of an antipyretic, the temperature decreased to 41.1°C. The frequency and character of respiration, however, remained unaltered. The animal died at about 10:00 o'clock p.m. of the same day.

DIAGNOSIS

On account of similarities in symptoms, the disease was at first mistaken for hemorrhagic septicemia. That it was a peracute form of hog cholera was shown by post-mortem findings. Hemorrhagic septicemia was excluded by laboratory findings of the Bureau of Animal Industry.

TREATMENT

The treatment was purely symptomatic. In an attempt to overcome the infection, its cause not being known, 400,000 units of crysticillin and 1 gram of dihydrostreptomycin were injected intramuscularly at four-hour intervals. On account of the high fever, 2 cc. of novaldine and 10 cc. of quinine calcium (Sandoz) were administered, also intramuscularly. An enema consisting of soapsuds in tepid water was also given.

POST-MORTEM FINDINGS: EXTERNAL EXAMINATION

Rigor mortis was present. The eyes were half-closed and the mouth was partly open, with scanty bloody discharges at the commissures. The visible mucous membranes were cyanotic. The skin on the ears, flanks, and abdomen was purplish red.

INTERNAL EXAMINATION

Both lungs were congested. The atria, ventricles, coronary fat, and pericardium of the heart were studded with petechial hemorrhages. Similar lesions were noted on the surfaces of the kidneys, giving these organs a characteristic turkey egg appearance. A cyst, the size of a twenty-centavo coin, was found on the left kidney. The liver had a cooked appearance caused, no doubt, by the high fever. A number of hemorrhagic infarcts were observed on the spleen. The mucous membrane of the stomach, especially at the region of the pylorus, was bright red. There was also a slight reddening of the pleura and the peritoneum. The lymph glands were swollen and congested. On section, the cut surfaces exhibited dark red marbling. The small and large intestines, as well as the mesentery and the genital organs, were apparently normal.

ANATOMICO-PATHOLOGICAL DIAGNOSIS

The diagnosis consisted of bilateral lobar pneumonia, pericarditis, nephritis, splenitis, gastritis, diffuse pleuritis, diffuse peritonitis, and lymphadenitis.

COLLEGE AND ALUMNI NOTES

The Department of Agronomy of the College, in cooperation with PHILCUSA-FOA and the Bureau of Plant Industry, sponsored a rice and corn improvement training school from May 18 to 21, 1953. Among the speakers and leaders in the panel discussions on various phases of rice and corn improvement were the following: Dean L. B. Uichanco, Assistant Dean F. O. Santos, Dean L. E. Call, MSA Agricultural Director R. G. Johnson, Director D. B. Paguirigan of the Bureau of Agricultural Extension, Director G. Merino of the Bureau of Plant Industry, Director M. M. Alicante of the Bureau of Soil Conservation, President Arcadio G. Matela of the Central Luzon Agricultural College, Dr. E. Miles, Mr. J. V. Hepler, Mr. C. Wilkey, Dr. J. P. Torres, Dr. G. M. Reyes, Mr. M. Constantino, Mr. V. Borja, Mr. F. B. Serrano, Mr. F. O. Solpico, Prof. M. E. Robinson, Dr. H. K. Hayes, Dr. G. C. Kent, Dr. C. A. Bratton, Prof. A. M. Goodman, Dr. L. G. Gonzalez, Dr. V. C. Calma, Dr. D. L. Umali, Dr. G. O. Ocfemia, Dr. F. T. Orillo, Dr. S. M. Cendaña, Dr. G. B. Viado, Dr. J. M. Capinpin, Prof. N. B. Tablante, and Prof. A. B. Catambay.

Mr. Joe Walker, of FOA, Manila, accompanied by Mr. Eugenio Cruz, '25, of the Bureau of Plant Industry, visited the College on April 17. While stationed in Cuba, Mr. Walker introduced kenaf into the Philippines by sending a package of seeds to this College.

Dr. C. E. Barthel, Jr., assistant director of the Armour Research Foundation, Chicago, U.S.A., visited the campus on May 12, 1953. He was accompanied by Mr. Quintin Eala, '27, librarian of the Institute of Science and Technology, Manila.

Mr. Albert Ravenholt, of the American inventions field staff, Chicago *Daily News* Foreign Service, came to this College on May 15, 1953, to gather material about the PHILCUSA-FOA aid to the College and Central Experiment Station.

The College Christian Church gave a welcome program for the International Work Campers on May 8. Among the numbers in the program were a welcome message by Dean L. B. Uichanco; a folk dance "Tinikling" by Misses E. B. Lapuz and N. J. Cruz and Messrs. T. Flores and D. Gorrez; and an instrumental selection by Mr. J. Aljas.

Dr. Valente Villegas, '13, head of the Department of Animal Husbandry, was elected honorary member of the Philippine Veterinary Medical Association at its 13th annual convention last April.

Dr. Jose M. Capinpin, '20, acting head of the Department of Agricultural Botany, represented Princeton University on May 17, 1953, at the inauguration of Teodoro T. Evangelista as fifth president of the Far Eastern University.

Mr. Tomas L. Mangasep, '48, was recently appointed principal of the Batac Rural High School, Ilocos Norte.

Lt. Col. Flaviano P. Olivares, '36, of the General Staff, I MA, visited the campus on June 10, 1953.

Messrs. Jesus P. Mamisao, '30, Ignacio R. Ang, '32, and Silvino C. Hernandez, '29, of the Bureau of Soil Conservation, were campus visitors on May 16, 1953.

Mr. Jorge P. Juliano, '51, instructor in the Department of Agriculture, Silliman University, is at present pursuing postgraduate studies in agriculture at Pennsylvania State College, U.S.A.

Mr. Orencio M. Lawas, '49, of the Guinobatan Abacá Experiment Station, Bureau of Plant Industry, is temporarily assigned to work with Dr. George C. Kent in connection with the latter's research on cadang-cadang in the Department of Plant Pathology of the College. The arrangement is in line with the co-operative program of the College and the Bureau of Plant Industry.

The first semester, 1953-1954, opened on June 17, 1953, with a record enrollment of 1,636 students, excluding 64 cross-registrants from the College of Forestry. The present enrollment is 564 times greater than that of the first semester of the previous academic year. There are 807 freshmen, 425 sophomores, 210 juniors, 171 seniors (including 15 A.A. seniors), 22 postgraduates, and one special student. Of the total enrollment, 196 are women students, 84 of whom are enrolled in the Home Technology curriculum. The enrollment in the UP Rural High School is 236, an increase of 18 students over that of last year. This number includes four special students and excludes seven cross-registrants from the Colleges of Agriculture and Forestry.

The opening exercises for the first semester of the present academic year were held on June 17, 1953, at Baker Memorial Hall. Featured in the program was a short talk on the Cornell-Los Baños project by Dr. George C. Kent, professor of Plant Pathology. Other speakers were Professor Nathaniel B. Tablante, President Vicente L. Saplala of the Student Body Organization, President Concepcion L. Valera of the Associated Women Students, and Dean L. B. Uichanco. Musical numbers were rendered by the UP Los Baños ROTC Band, under the baton of Mr. Gerardo Baes, and by Messrs. Salvador Merino, Domingo Lapeña, Jose Aljas, and a choral group of AWS members and selected students.

Dr. K. Ramiah, FAO rice specialist, was guest speaker at an open meeting on June 16, 1953, at the Department of Agronomy. He talked on his observations on rice culture in the Philippines and gave suggestions for its improvement.

Honorable Pio Pedrosa, president of the PNB and chairman of the ACCFA, recently donated to the College one Poland-China sow and two gilts.

The Department of Animal Husbandry received from MSA the following livestock: nine Brown Swiss cows and one bull, two boars and eleven gilts of the Berkshire breed, two Toggenburg does and two Anglo-Nubian bucks, and twenty-two rabbits (five New Zealand Whites, nine Californians, and eight Giant Japanese).

Mr. Marcelino Constantino, '16, chief of the Experiment Station and Seed Production Division, Bureau of Plant Industry, was a campus visitor on June 25, 1953.

Dr. J. M. Capinpin, '20, acting head of the Department of Agricultural Botany, has been invited by the National Committee of Genetics and the National Committee of Plant and Animal Breeding, established by the Science Council of Japan, to help in drafting a set of general rules for gene symbolization, with special regard to important plants and animals. The set of rules will be considered at the meeting of the International Union of Bibliographical Sciences and also of the IX International Congress of Genetics, which will be held in Italy.

Dr. F. M. Sacay, '25, head of the Department of Agricultural Education of the College, arrived by plane on July 8, 1953, after a three-month travel in the United States and Puerto Rico where he observed the latest trends in agricultural education as an MSA-PHILCUSA fellow.

Mr. Manuel B. Villano, '30, acting general manager, Philippine Sugar Institute, accompanied by Messrs. Federico P. Goseco, '26, and Alejandro R. Apacible, '34, also of the same office, visited the campus on June 23, 1953.

Mr. Pablo J. Alfonso, Jr., '49, instructor in zoology at the College, left on July 13, 1953, aboard the *President Cleveland* to pursue postgraduate studies in entomology as a Fulbright and Smith-Mundt scholar. He will undergo orientation at the University of Wisconsin, after which he will proceed to the University of Kansas for his regular postgraduate courses.

Mr. Orencio M. Lawas, '49, passed the civil service examination and qualified for the Italian Scholarship in rice culture.

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